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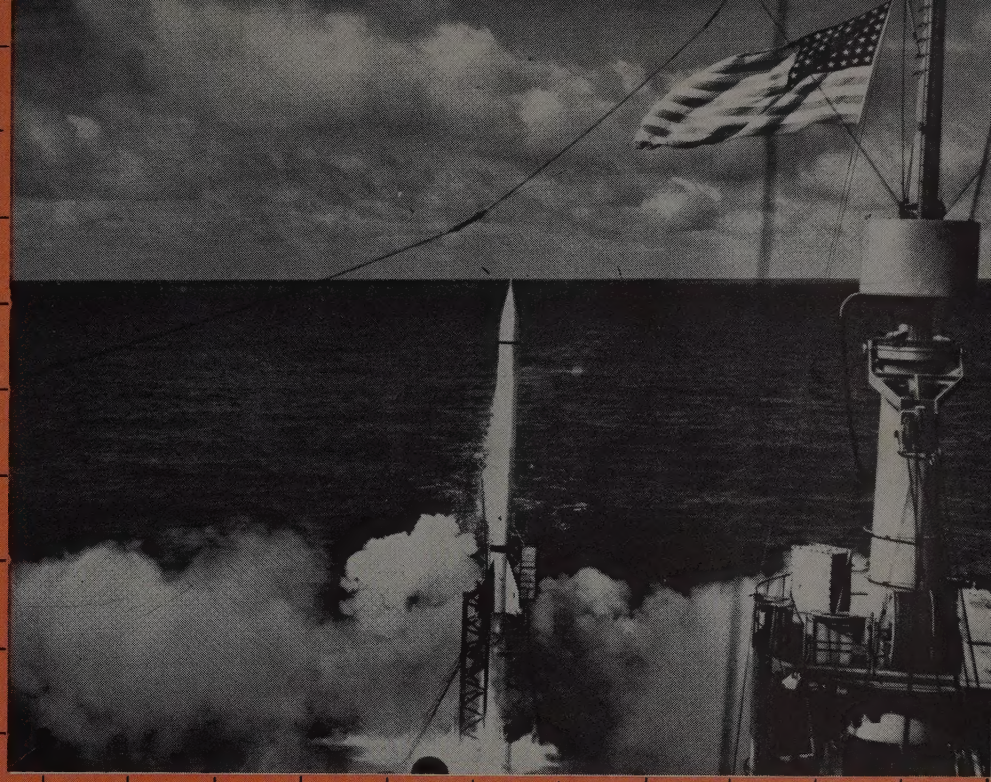

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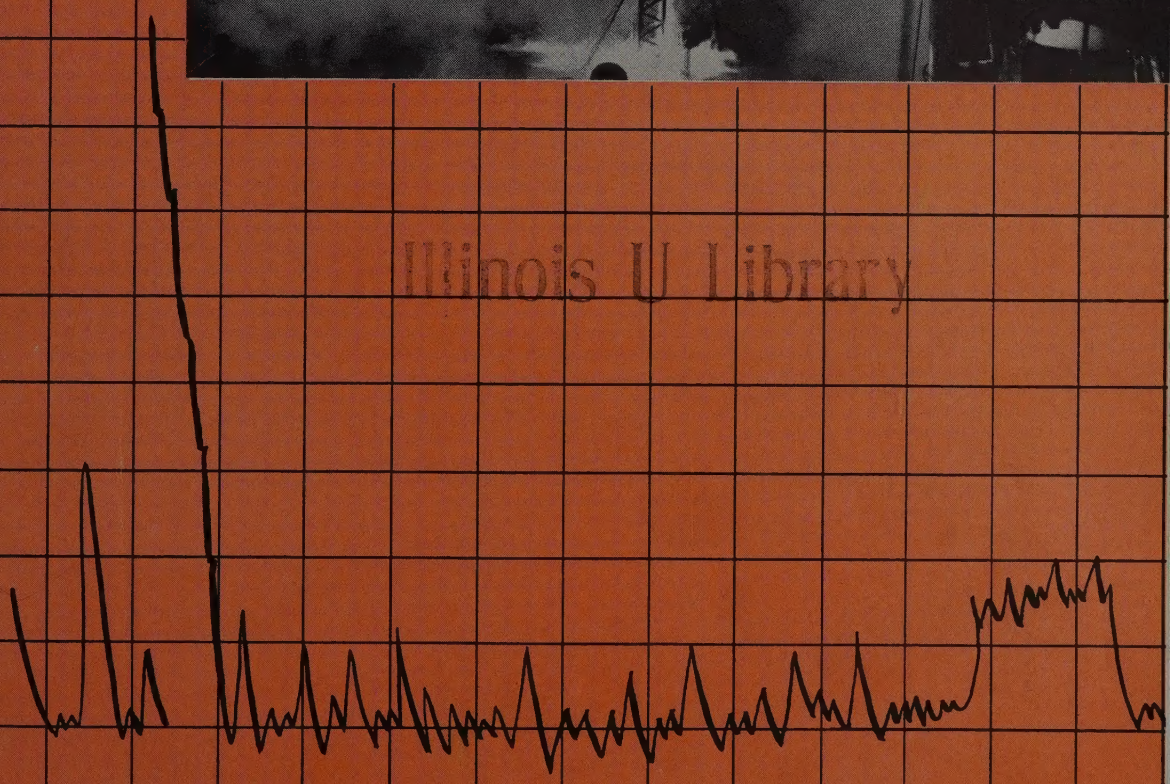

the **illinois technograph**

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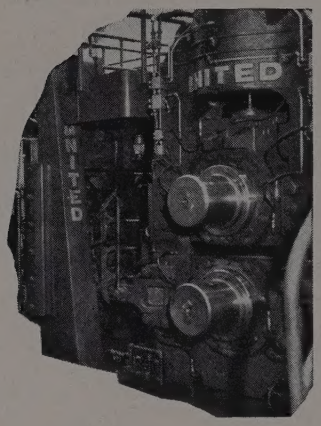
may, 1951

*Another page for* **YOUR BEARING NOTEBOOK**




## How to keep a roll neck from becoming a bottleneck

Bearings in a billet mill have to be rugged to carry the tremendous separating forces in the rolling of steel. To insure continuous production and long, trouble-free performance, engineers specify Timken® roll neck bearings. That's because Timken balanced proportion roll neck bearings permit higher rolling speeds, minimize roll neck wear, and have maximum capacity.

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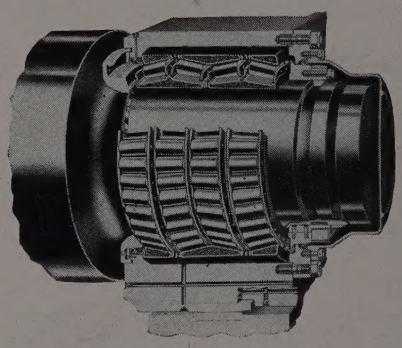
## TIMKEN® bearings keep costs low

Tonnage records indicate that Timken bearings help keep cost per ton of steel rolled to a minimum. In many mills Timken roll neck bearings are still going strong after more than two decades of service. Because of balanced proportion design, they give greater mill rigidity, permit larger diameter roll necks than ever before. Roll neck strength is increased 50 to 60%. Load ratings are increased up to 40%.



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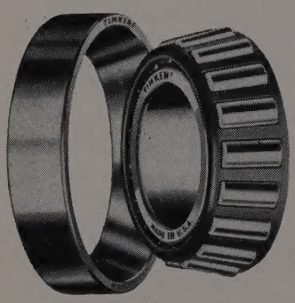

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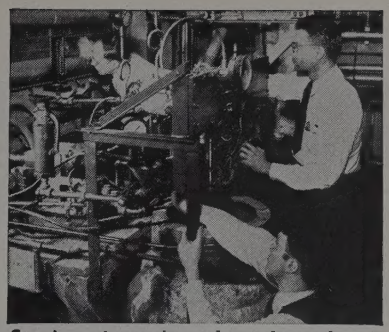
*TAPERED ROLLER BEARINGS*

## Learn more about bearings

Some of the engineering problems you'll face after graduation will involve bearing problems. If you'd like to learn more about this phase of engineering, we'll be glad to help. For additional information about Timken bearings and how engineers use them, write today to The Timken Roller Bearing Company, Canton 6, Ohio. And don't forget to clip this page for future reference.

**NOT JUST A BALL ○ NOT JUST A ROLLER ⬭ THE TIMKEN TAPERED ROLLER ⬭ BEARING TAKES RADIAL ⧆ AND THRUST —⧆— LOADS OR ANY COMBINATION ✳**

# THE DU PONT DIGEST



**Carrying out** *experimental autoclave polymerizations of condensation polymers: J. H. Blomquist, Ph.D. Chemistry, Ohio State '41; O. A. Bredeson, Ph.D. Chemistry, M.I.T. '41; J. E. Waltz, Ph.D. Chemistry, Indiana '41.*

## Research Takes the Long View

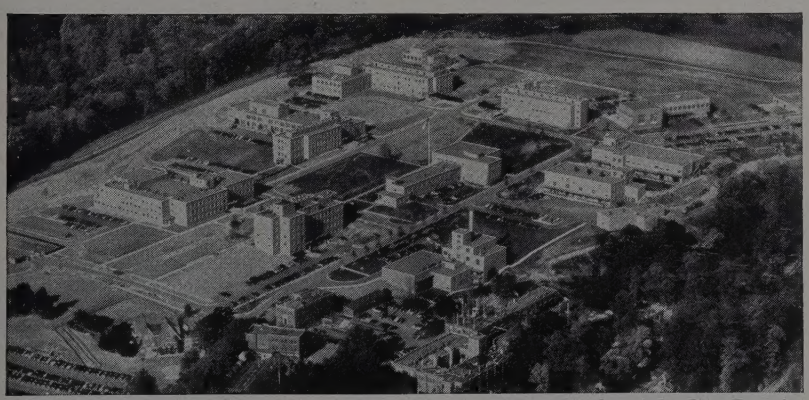
### Fundamental studies are one of the most important phases of Du Pont research

Fundamental research is designed to discover new scientific facts without regard to specific commercial use. Yet from it have come many products of commercial significance.

At Du Pont, for instance, fundamental research has pointed the way to products like nylon, the first wholly synthetic organic textile fiber, and neoprene chemical rubber, to name only two.

"products of tomorrow" will come from the test tubes, flasks and stills of the research laboratory, the Du Pont Company recently expanded its Experimental Station near Wilmington. In this thirty million dollar addition, major emphasis is being given to long-range and fundamental research.

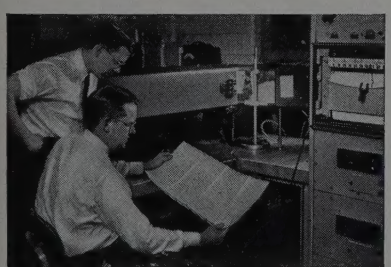
The enlarged Experimental Station with its 20 new buildings represents one of the largest and best-equipped research establishments in the world. Even so, less than half of the Company's total research personnel is situated here. Du Pont laboratories in more than 25 other locations also carry on both fundamental and applied research.



**Where long-range** *and fundamental research is emphasized: the newly enlarged Du Pont Experimental Station near Wilmington. Photo Aero Service Corp.*

### Expanding for Tomorrow

With the expectation that still more



**Examining** *an infra-red spectrogram of polyvinyl alcohol in connection with the fundamental physical characterization of the polymer: J. R. Downing, Ph.D. Physical Chemistry, Illinois '40, and D. G. Pye, Ph.D. Physical Chemistry, Stanford '43.*

There are now about 800 technical people engaged exclusively in research work at the Experimental Station. Assisting them are 1,500 others, in technical and non-technical capacities. The research people represent a wide range of training. Among them are organic, inorganic, physical, colloid, analytical chemists and biochemists; physicists and biophysicists; chemical, mechanical, metallurgical, electrical and electronics engineers; plant pathologists, plant physiologists, agronomists, entomologists, horticulturists and others trained in biological science. In addition, there are specialists who are not classified in any of these groups.

### Free for Research

At the Du Pont Experimental Station every effort is made to permit the research man to concentrate on research. He is provided with the most modern laboratory tools and for the construction of special equipment he can call on a wide variety of services. These include machine shops, carpentry, electrical, welding, instrument-making, and glass-blowing shops. When the research worker needs any service or equipment within the scope of these shops, it is provided for him.

At this industrial research laboratory, Du Pont scientists are devoting themselves to extending the frontiers of science and creating "Better Things for Better Living . . . through Chemistry."

**DID YOU KNOW THAT . . .**

Nylon came out of a fundamental research program begun in 1927. However, it took 13 years and $27 million in research and operative investment to get into satisfactory commercial production.

DU PONT

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**BETTER THINGS FOR BETTER LIVING**
***. . . THROUGH CHEMISTRY***

Entertaining, Informative — Listen to "Cavalcade of America," Tuesday Nights, NBC Coast to Coast

# skimming industrial headlines

edited by Henry Spies, Ag.E. '52

## amazing pump

The University of Illinois' engineering research program has come through again. It happened during Spring Carnival week, when almost anything is possible.

This mechanical freak pumps water with a length of clothesline—no pipes, no valves, no buckets, just a clothesline and a couple of pulleys and a ¼*hp.* electric motor.

Vera's Rope Pump was rediscovered by Prof. Henry L. Langhaar and Prof. William M. Owen of the T. & A. M. department in an ancient tome "History of Hydraulic Machines", published in the early nineteenth century. At that time, the idea was considered useless, just as it sounds today.

The water sticks to the up-bound rope and is thrown off when it passes over the top pulley. The bottom pulley, weighted by a piece of scrap-iron keeps the rope from tangling on the way down for more water. At present, the pump is raising 12 *gpm.* to a height of 25 *ft.,* with the ropes traveling at 2400 *fpm.,* but it has been known to lift water to the height of 145 *ft.* Its capacity is limited only by the number of ropes used and the speed at which they move.

The pump has considerable merit because it can be made from materials that are easily obtainable, it does not need priming, does not freeze, and is simple to operate. Its main field of development is as an emergency pump.

What will be coming out of the fluids labs next, a perpetual motion machine?

## ionization control

Sufferers of asthma, chronic colds and hay fever may, at last, find some relief by using new ion controllers which make indoor air like outdoor air at its best.

Although the medical profession has known for some time that negatively ionized air breathed by humans has a therapeutic effect on certain ailments, it has only been recently that scientists have developed a method of providing negative ions without objectionable ozone and nitrous oxide.

Devices known as Ionix and Wexon units are ion emitters arranged to filter out positive ions while negative ions are carried into the room by air currents passing through the units.

A simple means for screening out positive ions and selecting negative ions for distribution in the household has also been developed by Wesix engineers. One of the principal components of the heater is a pure nickel cloth which forms a negatively charged grid surrounding the heating element which is made of nickel-chromium alloy.

These ionizers are adaptable to all types of climate. For cold weather conditions the Ionix heater is rated 1000 watts or more. In warm climates the Wexon is a 30-watt platinum high temperature filament or equivalent emitter, arranged to generate negative ions when heat is not needed. In this type of heater, the negative ions neutralize positively ionized dust and pollen as air is circulated through the unit.

These units help to prevent or relieve asthma and related illnesses, and have been used in cooperation with medical people.

## color tv tube

A war-born-electronic tube, once used to jam German radar units, now is being groomed to serve as a high-power transmitter for color television.

Details of the tube — described as "the most powerful of its kind yet developed"—were revealed by Westinghouse scientists.

Although emphasizing that the tube —called a reflex Resnatron— is still in the laboratory stage, the scientists declared that "it opens the road to more television stations, greater range, and better reception, particularly in the field of color television."

When color television channels are alloted, most of them will come from the so-called ultra-high frequency region being reserved for them. This will require special transmitters capable of sending out continuous high-power signals at these frequencies.

The reflex Resnatron in laboratory trials already has delivered approximate-

(*Continued on page* 28)

Professors Henry L. Langhaar and William M. Owen watching their rope pump in action.

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# the illinois technograph

**volume 66** **number 8**

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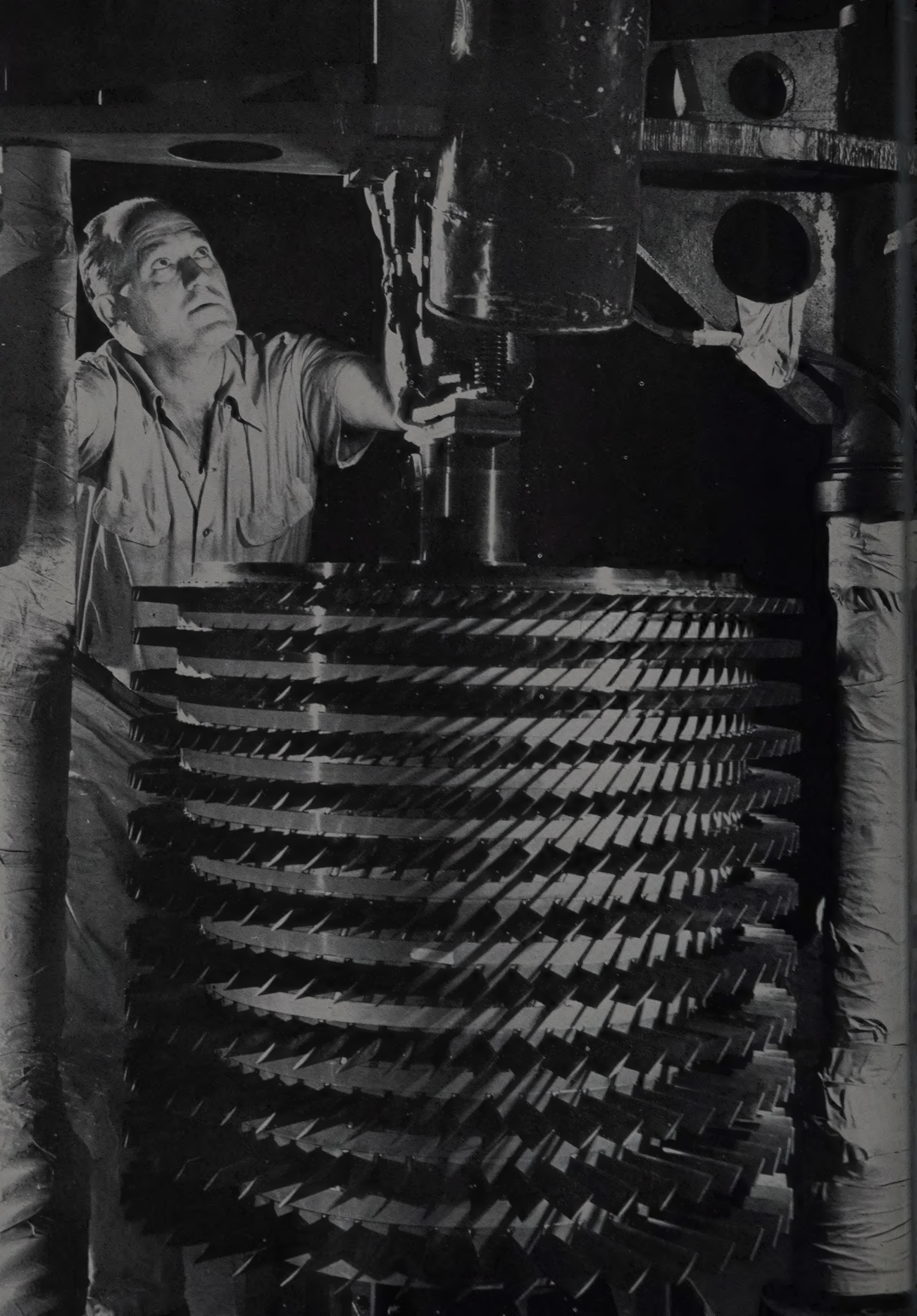
## *our cover*

A Martin Viking high-altitude research rocket takes off from the deck of the Navy's guided missile research ship, the Norton Sound, to establish a new altitude record for American-built single-stage rockets—106.4 miles. Scene is on the equator south of Hawaii and the date was May 12, 1950. (Courtesy of Glenn L. Martin Co.).

## *our frontispiece*

In order to assemble the last stage rotor disk of General Electric's J-47 aircraft jet engine, it is necessary to heat the disk to 700 F. while the spacer rings are cooled in dry ice, thus enabling the spacer to fit inside a shoulder on the disk and form a tight seal when it warms and expands. (Courtesy of General Electric).



# the life of a viking

by John R. Huber, ag.e. '52

One hundred days of birth and six minutes of flight mark the life span of a Viking rocket that starts as a labyrinth of calculations and ends as a few wavy lines on a strip of paper. Months of skilled labor and thousands of dollars worth of materials are expended for the data received during the short time of flight.

The Viking, a product of the Martin Company, has zoomed to an altitude of 107.3 miles above the Army's White Sands Proving Ground near Las Cruces, New Mexico. (This altitude was achieved with the fifth Viking sent aloft.) Thus, it is closely approaching the record of 114 miles set by a German V-2. Both the Viking and the V-2 are single-stage rockets.

After the main fabrication at the Martin factory and installation of the power plant from Reaction Motors Inc., the Viking is moved to the White Sands hanger for a complete series of checks and tests. Then, about a week before firing time, it is carefully trundled to the firing sight and raised by a gantry crane. The erection marks the beginning of a hectic but well coordinated week of final wiring and rechecking. The most dramatic test performed is the static firing of the 20,000 lb. thrust engine. The rocket is bolted to the launching platform during this test and the flame is directed into a pit of water.

The afternoon before firing sees an "interference check" being run. At this time, the gantry crane is moved from around the rocket, power lines are attached, and every man takes his post. Firing personel take their places in the concrete block house some 150 *yds.* from the missle and continually check their instruments as the count-down moves toward "X", the firing time. If trouble is found in any of the recording or controlling instruments the counter "holds" until the necessary repairs are made.

With the check completed the gantry is rolled back over the rocket and last-minute preparations are made. The telemetering data obtained during the check is studied and if everything has functioned properly the firing is set to proceed as scheduled.

Final work is stepped up and proceeds through the night before firing. If the next morning promises favorable weather and everything is in order, the firing time is set: "X-minus four hours." It is impossible to calculate the exact time of firing, though, due to the many possible "holds" in time

At about three hours before take-off the fueling operation begins. Hydrogen peroxide, used to power the turbopump, is poured into the missle by men garbed in oilskins. One of the two fuel tanks is filled with ethyl alcohol and the other with 7,000 *lbs.* of liquid oxy-

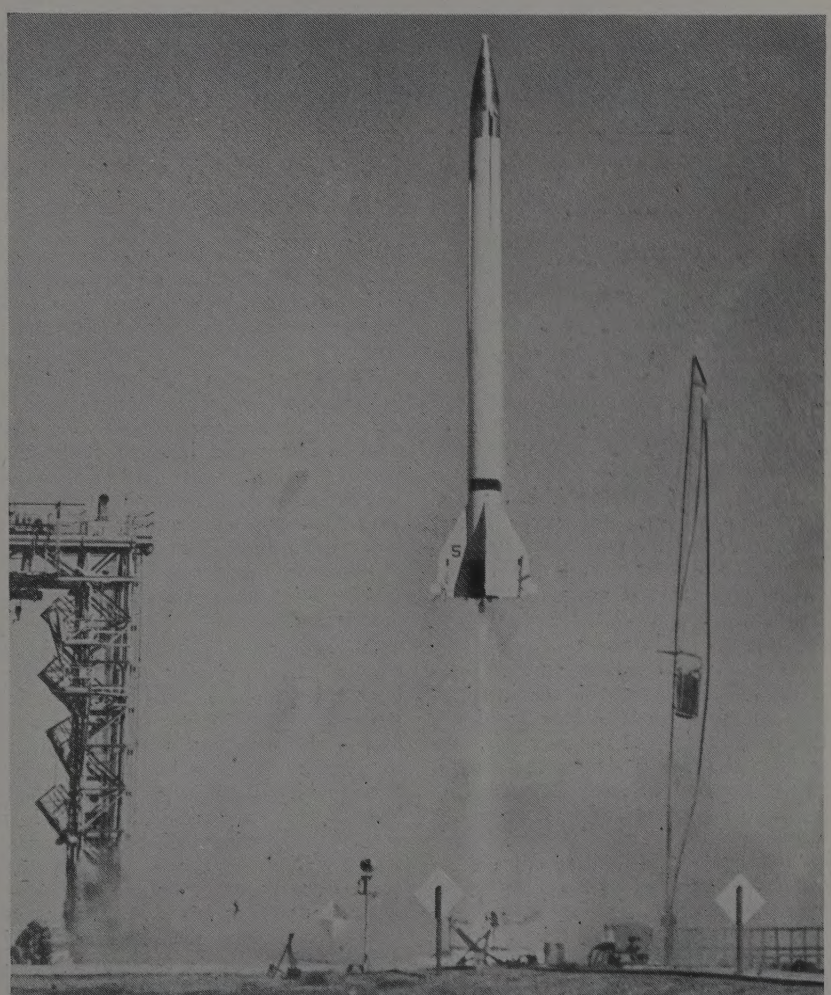
(*Continued on page* 26)

JOHN R. HUBER

**Voila—another article by one of TECH readers' favorite writers—John Huber.**

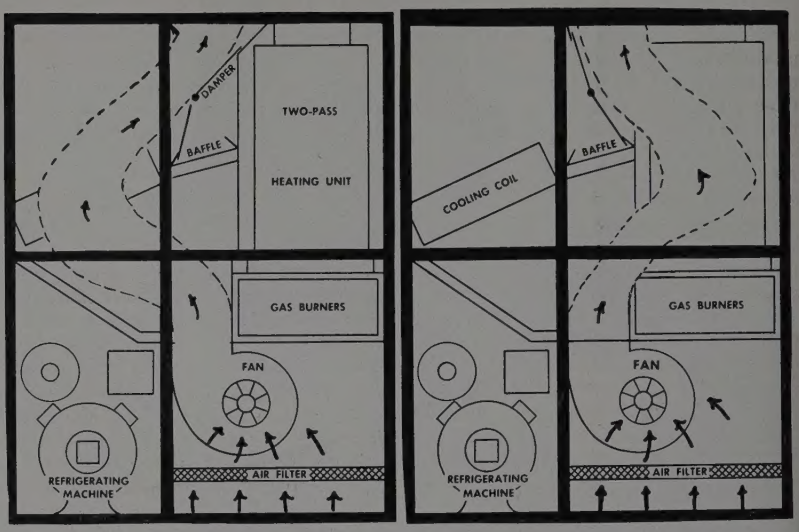
**A Galesburg alum, former scribe and now Engineering Council representative from ASAE, co-editor of last year's AG. E. ANNUAL, a committee member of I SEE; TECH assistant editor and a new initiate of Tau Beta Pi sum up John's scholastic and extra-curricular interests.**

**One we forgot—he is also a brand-new husband, as of last April 29.**



A Viking high-altitude research rocket is off to a new record of 107.3 miles—straight up! (Courtesy of Glenn L. Martin Co.)

*new air conditioning systems offer . . .*




In this system air is first drawn in and filtered. In the summer (left) it is cooled and dehumidified in a cooling coil. In cold weather (right) the air is warmed in the heating chamber. (Courtesy of Carrier Air Conditioning)

# packaged comfort

**by Bill Anderson, m.e. '51**

With the cold winter almost a memory and summer approaching, people once more are dreading the thought of the sweltering, humid days to come. The first reaction is to head for the nearest summer air conditioned theater. However, because of the great improvement in residential air conditioning a large number of these people can now enjoy this comfort at home.

All residences located within a region that requires heat during the winter season contain some type of conditioning system for heating during the winter, but few of these structures have provisions for conditioning the air during the summer.

Several misconceptions must be corrected before the term "air conditioning" has any meaning. The heating of air, the conditioning of summer air, the cooling of summer air, or the circulation of the cool air from the cellar of a residence by the use of the fan on the heating unit is not air conditioning. Air conditioning is the simultaneous and coordinated control of air temperature, velocity, humidity, and quantity, twenty-four hours per day throughout the year.

Air conditioning is produced by an apparatus consisting of one unit that conditions the air during the heating season (winter), and another apparatus that conditions the air during the summer season. Because air conditioning consists of two different methods of treating air, it has recently been divided into two separate systems; ie, winter air conditioning and summer air conditioning.

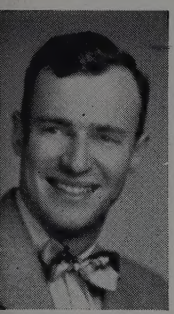
When the term "air conditioning" is mentioned, most people think immediately of summer air conditioning and tend to forget that it also includes the winter conditioning of air. This misconception results from the fact that most apparatus for treating summer air produces summer air conditioning, while the apparatus for treating winter air usually heats rather than fully air conditions the air.

A residence is primarily heated by warmed air. In gravity warm air heating systems, air is the only heating medium; air in the hot water heating system is the secondary heating medium, the primary one being hot water. Radiators emit less than 30 per cent of their heat to a room by radiation; the balance of the heat is supplied by the natural convection of the air within the room. Gravity warm air and hot water systems as well as forced hot water systems depend upon the phenomenon of natural convection to produce a circulation of the air. Natural convection is a function of the pressure differential caused by the difference in density of the warmed air leaving the heating apparatus (warm air furnace or radiator), and the density of the cooler air that comes into contact with the apparatus. This density differential is a function of the temperature of the heating apparatus and the room temperature. The only controllable factor is the temperature of the heating apparatus. Gravity heating systems cannot be considered winter air conditioning systems primarily because the air movement cannot be controlled separately from the heat emission, and secondly, because humidification cannot be controlled. Humidification, in most instances, is evaporation of water from an open receptacle placed near the heating element.

The application of the forced warm air heating system to residences makes winter air conditioning possible. In this forced air system the fan affords a means for the control of air quantity and velocity. The humidifying apparatus provides a method for regulating the moisture content of the air, and by suitable control, the air leaving the apparatus is maintained at the desired temperature.

The winter air conditioning system installed for residential application is the "packaged type" which is either pre-assembled or field assembled, except for very large residences that require a specially designed system. "Packaged

units" permit standardization and mass production—the result is a satisfactory unit at low cost. A "packaged unit" contains the heat transfer apparatus, the fan, and the humidifying apparatus within a single casing. A centrifugal fan forces air over the heat transfer apparatus, and a humidifying device supplies the air with the required amount of water vapor. The heat transfer apparatus contains a combustion chamber in which fuel (solid, liquid, or gas) is burned to supply the necessary heat. The choice of fuel is a function of its relative cost, availability, and its calorific value.



**WILLIAM A. ANDERSON**

**Just to prove that engineers can be versatile, Bill Anderson, the TECH's business manager, joined the editorial staff for this issue and tried his hand at writing a full-length article. We of the editorial staff looked down our noses at the poor man and said, "Not bad, son."**

**Seriously though, Bill has done a mighty nice job on his specialty, air conditioning. A graduating M.E. and Air Force veteran, Bill is a member of ASME, a prospective member of SAE, and has been on TECH for four years.**

Packaged units, pre-assembled or field assembled, are available in varied sizes commensurate with the heating requirements of the residence. The heating requirements may be satisfied by installing various integrated units, each unit applicable to a definite heating range, or by using an assembly of the required number of heating elements and centrifugal fans together with a humidifier of the required size.

The winter air conditioning apparatus may be floor-mounted or hung from the ceiling. If the heating demand is large, several "packaged units can be installed in parallel rather than designing a special installation. In residences, the winter air conditioning apparatus is connected with a duct system through which the air is forced to the rooms.

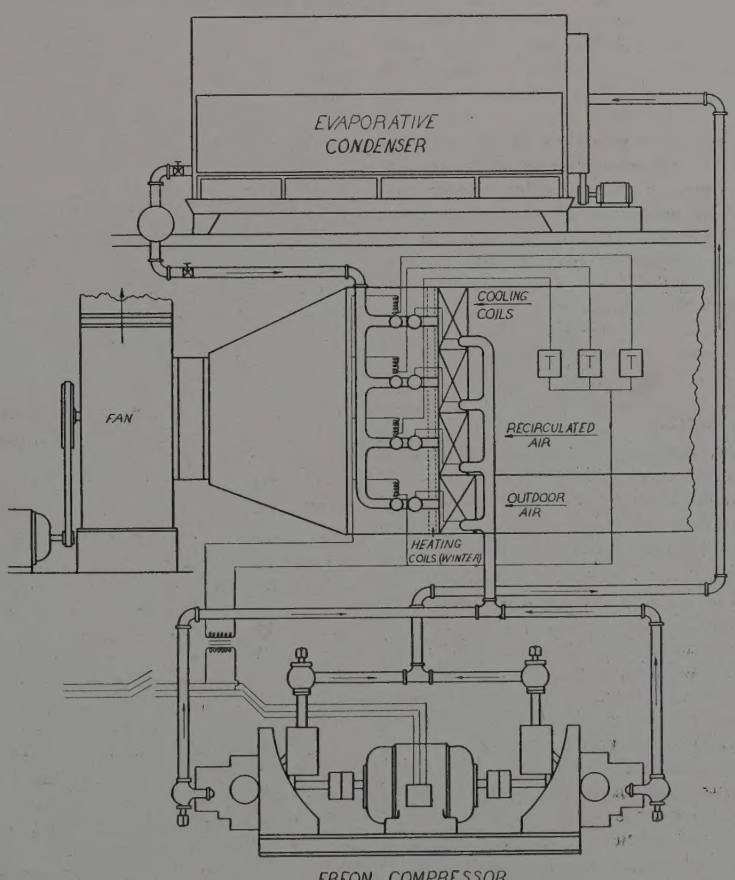
The homeowner considers summer air conditioning as a luxury, except when it is required by industry. Because the conditioning of summer air is not essential for human existence, the homeowner is slow in accepting summer air conditioning for residential use. The high initial cost limits the consumer demand, which in turn prevents mass production—the very thing that can cause a lower initial cost. However, extensive use by industry and increased consumer trade are effecting a decrease in the initial cost, so that eventually the installation of summer air conditioning systems in residences will become an established custom.

"Packaged units" contain the heat transfer apparatus, a unit for the collection of the moisture removed from the air, the fan, a compressor, and condenser within the same casing, the component apparatus integrated into a serviceable unit. The heat transfer apparatus, the evaporator, is a pipe coil through which a refrigerent flows and over which the air is forced by the centrifugal fan. The refrigerant in common use in residential units is Freon-12 because it satisfies the requirements of this type of refrigerant apparatus, and is inexpensive, nontoxic, and noncombustable. The refrigerant is the primary cooling medium and the air is the secondary cooling medium. The moisture in summer air causes more discomfort than the high temperature. The evaporator dehumidifies the air and thereby lowers its temperature. This dehumidification, a function of the apparatus dew point, can lower the air temperature below the design temperature. When this condition exists, the air must be warmed before it is emitted to the rooms. In residential applications that is accomplished by passing air around the evaporator and mixing it with the conditioned air so that the mixture satisfies the design conditions. The refrigerent flows from the evaporator (the heat exchanger) into a compressor in which its pressure is increased with a resulting increase in temperature. The refrigerent is forced into the condenser in which its temperature is decreased and the vapor refrigerant is condensed. This liquid refrigerant is introduced into the evaporator through a throttling valve, thereby completing the refrigeration cycle. The compressor and the condenser in large summer air conditioning installations are installed in a location separate from the evaporator. However, in normal residential installations these units are located within the same packaged unit.

When an abundant supply of city water is not available, or its application is not permitted, the condenser water must be processed in a cooling tower, The warm water from the condenser is sprayed through the air in the cooling tower. When a small portion of the water vaporizes, the heat of vaporization necessary for this transformation is supplied by the remaining water. This loss of energy reduces the temperature of the main body of the water.

The summer air conditioning unit is

(*Continued on page* 26)




**In the Airtemp system air is drawn in, filtered, dehumidified, and recirculated several times through banks of cooling coils. A series of thermostats controls temperature. (Courtesy of Chrysler Airtemp)**

— *the university of illinois at . . .*

# navy pier

**by Ray Lindahl, Arch.E. '54**

## harvard on the rocks

For time immemorial, it has been a well known fact that the *Pier Illini* has consistently printed very little news about the engineers and archies. With this knowledge, the archies, for two months, attempted to have their club recognized as the club of the week in that newspaper of questionable integrity. Upon getting no favorable response, and after being continually cut out of this feature column, the archies sent the following letter to the club editor, a certain Miss Shirley Moscovitz.

April 19, 1951
Room 252
God's Country
Navy Pier

Sweetheart:

We, the "big wheels and spokes" of the Navy Pier Student Chapter of the AIA, do hereby present this ultimatum and WARNING in accordance with, and approval of the "law."

Either the Navy Pier Chapter of the AIA be humbly presented as the club of the week in the April 30, 1951, issue of the unread and objectionable *Pier Illini,* or else, we will, in our usual intellectual and artistic manner, start proceedings toward the ultimate end of annihilating one club editor, as well as any structures or big time operators of the *Pier Illini,* the so-called newspaper of our beloved Harvard on the Rocks, who happen to be around when the action starts. This letter is being made in quadruplicate in order to relieve the undersigned future architects of this fair country of the dire consequences that will take place, if the requirements of this petition are not fulfilled. Remember that you have been forewarned with a long period of grace before catastrophe.

Being of sound mind and body, and with full consideration of the implications, we, the undersigned, do hereby pledge ourselves to do the utmost within our power toward the fulfillment of our position in the above stated memorandum.

It took this letter and the signatures of more than 75 per cent of their department to finally receive the supposed honor of being featured in the *Pier Illini,* the paper written for and by the LAS and Commie colleges. We present this, not in criticism of the paper, but as a public service to our buddies in the engineering societies.

We have heard that the math department is in favor of automatically flunking every architect, even before they enter a class. Their contention is that it would be easier on their nerves if they didn't have to bother about these fellas who never do any homework. We would like to state that it w ould also be easier on the nerves of the archies if they didn't produce signs, and their other contributions that produce interest in student activities. Remember it is these activities that influence new students to enter, and who'll do all this dirty work if an embargo is instigated?

Enough of this preaching. Let us go on to this intellectual statement made by an unnamed ME. He claims that refrigeration is the controlled removal of heat from a desired body.

Congratulations to the archies and EE's for their fine open house exhibits that enabled them to tie for first place in the contest for the H. P. Hoelscher award given to the best engineering society exhibit. Perhaps the CE and ME societies had better start preparing something spectacular, now. All you'll have to do is to have something better than the show by fan dancers, sponsored of course, by *Technograph.* With the all male jury, we are sure to win.

And so we close this semesters work with these final words of wisdom. May you have the best of luck on your ponies during the week of finals, and may we all be back in the fall, some on pro, a couple not, but back anyway to prove that civilian life is best after all. Ah reservoir till the fall rat race starts.

## engineering societies

### AIA

One outstanding speaker of this semester's program spoke at the April 17 meeting of the AIA. They were privileged at that time to hear Mr. M. A. Smith, an acoustical engineer from the U. S. Gypsum Company. He is one of the pioneers and leaders in the development of acoustical tiles. Not only that, but he is one of the founders of the Acoustical Society of America as well as author of important articles on acoustics. The students were very interested in his explanation of the important role that acoustics play in the design of large buildings. It was of great surprise to the group to hear of the great difference of sound transmission coefficients between the various standard construction materials.

Upon the request of Professors Prest-

(*Continued on page* 18)

# east chemistry dedication

by Don Sweet, e.e. '53

Friday and Saturday, March 30 and 31, marked the dedication of the East Chemistry building, the first new building for the use of the chemistry department of the U. of I. since 1930 when the Chemistry Annex was dedicated.

It was unamimously decided by the alumni to dedicate the building to the late Professor Samuel W. Parr, who was connected with the University's chemistry department from 1890 to 1926, and who inaugurated the first courses in chemical engineering in 1891.

DON SWEET

Don is the TECH staff pyrotechnician expert and will willingly set off fireworks, figuratively (at a TECH staff party) and literally (last year's I SEE) whenever asked. Last summer he was the head pyrotechnician at the Chicago Fair.

A sophomore in electrical engineering, Don is an AIEE-IRE member and a TECH assistant editor. Although a bit out of his professional line, he has done the Chem E's up proud on their new building.

Prominent Illini and alumni who were present at the dedication and who spoke on that occasion are President George D. Stoddard, Professor Roger Adams, head of the chemistry department, Park Livingston, president of the board of trustees, and Dean Henning Larson, of the College of Liberal Arts and Sciences.

On Saturday, March 31, the following alumni spoke for audiences composed of faculty members, students and friends of the chemistry department:

Robert L. Pigford, Ph.D. '42, chairman of the department of chemistry at the University of Delaware; Edwin R. Gilliland '30, professor of chemical engineering at MIT; Norman W. Krase '18, of the development department of E. I. duPont de Nemours; William L. Faith, Ph.D. '32, director of engineering in the chemical division of the Corn Products Refining Co.; Edward A. Doisy '14, M.S. '16, director of the department of biochemistry in the School of Medicine at St. Louis University; Wendell H. Griffith, Ph.D. '23, chairman of the department of biological chemistry and nutrition in the School of Medicine at the University of Texas; Vincent du Vigneaud, M.S. '24, head of the department of biochemistry in the College of Medicine at Cornell; and Thomas R. Wood, Ph.D. '40, head of the veterinary biological section of the Grasselli Chemical Department of duPont.

In mentioning the need for the new building, Dean Henning Larson said at the actual dedication ceremony, "The director of Brookfield Zoo would be horrified if he had to put his monkeys as close together as we have our professors of philosophy."

The Chem. E. building was originally planned in 1940. Construction was postponed, however, because of the war. The present building is just half the size of the originally planned unit. The East Chemistry building was built at a cost of $3,400,000, just twice the estimated cost of the building to be built in 1940. The present building has been designed so that it can be added to when the budget permits.

The new building has many beautifully equipped laboratories for the use of chemistry engineering and bio-chemistry students. Among the more interesting of these is the unit-operations lab. Modern industrial practice separates all chemical processes into six fundamental operations, distillations, extraction, filtration, heat transfer, absorption, and evaporation. The unit-operations classes study these operations in a large laboratory which has a 36 *ft* floor-to-ceiling distance. Mezzanines are located at the 9-, 18-, and 27 *ft* levels to provide vantage points for control and observation of the operations.

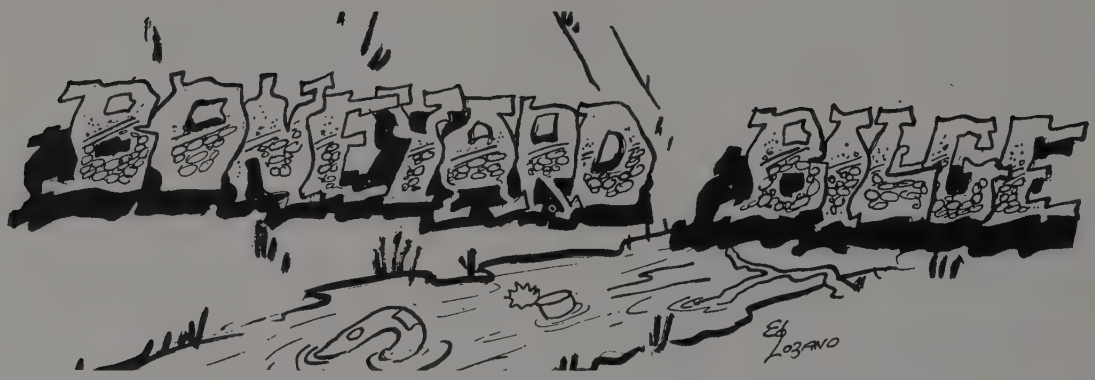
Some of the other labs are the high-pressure lab, the two-story chem projects lab, and the measurements and instrumentation lab.

In the high-pressure lab, chemical reactions are studied under pressures up to 5000 atmospheres. This lab is under the direction of Professor H. G. Drickamer.

Seniors in Chem. E. are given the opportunity of working on original ideas in the chem projects lab. Some of the projects underway at present include the determination of the heat-transfer coefficients of fluid films. The ultimate use of such knowledge will lead to the design of better heat exchangers. Another of the projects involves vapor-phase equilibria in multi-component systems, the final goal being the design of more

(*Continued on page* 20)

The main lounge of the East Chemistry building features the latest developments in modern design and comfort.




**by Bob Schrader, m.e. '54 and Jack Ullman, e.ph. '51**

Recently, in a beginning metallurgy course, the class was being entertained with slides of the different types of rock crushers. All went well as the slides were being shown one after another. Then, the figure of a scantily clad girl suddenly flashed on the screen. That brought down the house. If anyone knows of any other rock crushers of this type around, please send their vital specifications, name, address, and phone number to Boneyard Bilge, care of the *Illinois Technograph*. Such information will be greatly appreciated.

* * *

FLUSH YE BONEYARD

* * *

This one about Doctor Rodebush of the Physical Chemistry department has been making the rounds recently. Dr. Rodebush was telling his class about an exam which was coming up. He said that there would be four questions on the exam. The first question would be easy. Anyone with high school chemistry could do it. The second problem would require a good background in physical chemistry. But the third problem was tougher. Only God and Rodebush knew the answer to it. And, as for the answer to the fourth problem, God only knows.

* * *

FLUSH YE BONEYARD

* * *

Soon after Prof. A. R. (Buck) Knight returned from his trip along with the Illinois baseball team on their spring training jaunt, he received a visit from the sheriff. Professor Knight was thereupon presented with a legal notice which stated that he was barred from appearing at Illinois baseball games. According to this notice, he had earned his punishment "by failing to provide or otherwise obtain, in legal or illegal manner, by bribery of umpires, fixing of players, placement of pebbles, or use of pop or other bottles in approved fashion, hits and runs for the University of Illinois baseball team."

The notice went on to say that "it is hereby demanded that the said party of the first part, Abner R. Knight, be enjoined, forbidden, and barred from attendance or exercising other influences at any performance (game so-called) at home or abroad, during the 1951 season, or longer if during said interval he fails to mend his ways and atone for past sins of ommission, commission, permission, and submission." The notice was signed by about fifty "friends."

It seems as if the return of the baseball team from spring training and April Fool's day occurred at about the same time this year.

* * *

FLUSH YE BONEYARD

* * *

Ever stop to wonder about the size of the different engineering curricula here at the U. of I.? Well, here is all the data, straight from the second semester enrollment figures. The big three are, of course, ME, CE, and EE. ME and EE each have about 450 students, while CE has about 350. Only three other engineering curricula have more than 100 students enrolled. ChemE has 162, AeroEng has 123, and General Engineering has 106. Ag E, Ceramics, Met Eng, and Mining Eng, the remainder of the different branches, each contain from 50 to 100 students. Oops, I almost forgot Sanitary Engineering, in which ten people are enrolled.

* * *

FLUSH YE BONEYARD

* * *

Although engineering is sometimes thought to be a bugaboo for athletes, there is no shortage of engineer-athletes on this campus. A rough check reveals that at least a dozen engineers are on Illini varsity squads. The basketball squad has three: John Marks, Seymour Gantman, and Jim Hoffman. Engineers on the wrestling team include Hank Price, Wayne Gaumer, and Ed Jackson. Also, Dick Palmer and Ed Houser on the gymnastics team; Dick Reynolds, a half-miler, and Norm Smith, a sprinter, on the track team; and Jorge Quiros and Chuck Swensen on the fencing team are all engineers.

* * *

FLUSH YE BONEYARD

* * *

Dr. Baron of the Chem. E. department recently told a class about the usefulness of a Chem. E. According to Dr. Baron, companies in Europe used to hire a M.E. who didn't know anything about mechanical engineering and a chemist who didn't know anything about chemistry. But now the problem is solved. Along came the Chem. E. who knows nothing about both subjects, and is therefore doubly effective.

---

Little Willie was late for school and the teacher inquired as to the cause of his tardiness. "Mama was ill. Daddy called the doctor and I had to get my own breakfast."

"Well, you go right home and find out what was wrong with your mother," said the teacher. "It might be contagious in which case your presence in the room might expose me and the rest of the children."

Little Willie went home and came back in a short while. "Teacher," he said, "Mamma had a baby and she said to tell you that if you are a good girl you wouldn't get it."

* * *

Drunk (to splendidly uniformed bystander): "Say, call me a cab, will ya?"

Bystander: "My good man, I'm not a doorman, I'm a naval officer."

Drunk: "All right, then, call me a boat; I gotta get home."

# introducing . . .

**by Howard Hadler, ag.e. '54; Paul Mascal, e.e. '54; and Robert Quick, e.ph. '54**

## PROF. JOHN K. TUTHILL

Professor Tuthill, a man of many experiences and accomplishments, is a familiar figure to E.E.'s and many alumni. He was born in LeRoy, Illinois and graduated from the high school in that town. Mr. Tuthill married a LeRoy girl and now has a son, daughter, and two grandchildren.

Deciding not to follow his father's profession, which was medicine, John Tuthill entered Rose Polytechnic Institute. After two years at Rose, he joined the U. S. Navy, which he served as an electrician and brass-pounder. During his hitch with the Navy, he saw Japan, Panama, the Hawaiian Islands, Philippine Islands, and other parts of the Pacific. After his naval globe-trotting, Professor Tuthill returned to his interrupted studies. He received his B.S.

**PROF. JOHN K. TUTHILL**

n E.E. from the University of Illinois n 1914, and his E.E. degree in 1925.

After he acquired his B.S., he went o work for the Illinois Traction Comany, becoming a division superintendnt. Then, he left that job to return o the U. of I. as an instructor. Again, e left the University, this time to beome part owner of a Michigan power nd light company. In 1920, Mr. Tutill returned to the University as Reearch Associate in Railway Engineering with the Electrical Engineering Experiment Station. Since that time he has been on the faculty without interruption. In 1921 he was made assistant professor in the Railway Electrical Engineering department. In this capacity, he has been imprinting on the minds of many aspiring young engineers, including many father and son sequences, the knowledge they came to get, both in the old department of Railway Electrical Engineering and now, in the department of Electrical Engineering.

Professor Tuthill has conducted research and prepared exhaustive reports on many varied aspects of railroading, including rail bonding and welded joints, high-speed train resistance, rolling resistance, tonnage ratings, and performance tests on locomotives. In this latter field, he designed and supervised the building of a dynamometer test car. Since no one likes noise, he has studied car noise, city noise, and noise abatement. This extra-curricular work has been done for the Illinois Central, Illinois Traction System, Chicago Surface Lines, Rock Island R.R., and the American Bureau of Welding. Mr. Tuthill has many bulletins for the Engineering Research Station to his credit.

Professor Tuthill is, or has been, a member of the following social or professional organizations: AIEE, Society for the Promotion of Engineering Education, Illini Union Faculty Social Committee, Fraternity Advisory Board, Sigma Xi, Sigma Tau, Sigma Phi Delta, and also has been national secretary of Acacia. He is listed in the *Biographical Dictionary of American Men of Science* and *Who's Who in Engineering.* His book, *Transit Engineering,* was published in 1935.

**FRANK E. BLAKE, JR.**

For relaxation at home, Mr. Tuthill retires to his completely equipped woodworking shop. There his specialty is miniature and prototype furniture. His summers are spent at his cottage, Interlaken, on Dee Lake is Minnesota. For the past 22 years, he and his son have pursued the piscatorial prize with much vigor and enthusiasm.

## FRANK E. BLAKE, JR.

"The Engineers' Engineer" is a well-deserved title for Frank Blake, a prospective June graduate in sanitary engineering. Frank, as his fellow C.E.'s know, is a man who is as much at home inspecting a sewer or supervising concrete construction as he is addressing a formal meeting of ASCE.

He has had a good bit more engineering experience than most of the average engineering graduates. His people are in construction work, and it is said that Frank wore b l u e p r i n t diapers and teethed on his father's sliderule. For a number of years now, he has been employed during the summers by a Michigan construction company and has done work as timekeeper, ironworker, and carpenter on highway jobs in Michigan and Kentucky.

Frank was born on January 8, 1930, in Chicago. During his high school days there and in Springfield, Ill., he maintained a scholastic record high enough for him to merit membership in the National Honor Society, while at the same time carrying on his hobbies of model airplane construction and music. He has been playing the accordion for sixteen years and has become quite an accomplished artist.

Entering the University of Illinois in September, 1947, he maintained his scholastic work and won membership in Chi Epsilon, Sigma Tau, and Knights of St. Pat. He is now vice-president of Mu San, sanitary engineering honorary, of which he has been a member for three years. Frank is also an active member of the Illinois Society of Professional Engineers and the ASCE, serving the latter as vice-president last fall and as president this spring semester. At the present, he also holds a part-time research job at the hydraulic engineering laboratory.

Frank plans on getting married next September to Miss Lois Marie Johnson, an attractive senior in bacteriology whom he met last spring when he went to south campus to take a course in

(*Continued on page* 22)

# honorary and society news

by Chuck Wade, M.E. '52

## AFS

Wednesday, April 11, the American Foundry Society was host to Col. F. W. Dooley, U.S.A.F., Commanding Officer of the Air R.O.T.C. at the University of Illinois. Colonel Dooley's topic for discussion, "Opportunities For The Engineer In The Air Force," was received with unanimous approval. (This was of special interest to everyone now that the draft is foremost in our mind). Colonel Dooley explained that the Air Force's need for competent engineers has now made it possible for young men to continue their engineering and then, under the guidance of the Air Force College Training Program, enter the Air Force in a field akin to their profession. When Colonel Dooley had finished, the A.F.S. members and their sponsor, Prof. James Leach of the Foundry department, were left with the strong realization that here was another need for engineers.

In an effort to further the practical aspect of Foundry Engineering, the A.F.S. sponsored a field trip to the Central Foundry, Division of General Motors at Danville, Illinois, April 16, 1951.

The A.S.F. was host to Dr. W. Voskuil of the State Geological Survey on April 26. This talk was of particular interest to all students who are interested in the supply of metal ore, insofar as the mineral ore is concerned, for Dr. Voskuil's topic for discussion of the evening was "The Mineral Economies of the World."

## SIGMA TAU

A rushing smoker was held by Sigma Tau April 12 in Men's Residence Halls. The informal initiation of the fraternity was April 23-30. The initiation and Banquet will be held on May 9, the initiation being held in the Illini Union Building with the banquet folowing in the Hotel Tilden Hall dining room. Projected plans call for a picnic late in May.

## TRIANGLE

Climaxing its basketball season, the Illinois Chapter of Triangle Fraternity recently won first place in the Annual Triangle Invitational Basketball Tournament. The tournament was held at Northwestern this year and the games were played in New Trier High School gym. Teams from all over the Midwest were entered in the tournament. Some of these teams were teams from Louisville, Marquette, Michigan, Minnesota, Missouri Mines, Ohio State, Purdue, Wisconsin, Northwestern, Armour, and Illinois chapters. Illinois defeated Marquette in the final game to win the tournament. Following the tournament an informal dance was held at the Sherry Hotel in Chicago.

On Sunday, April 15, the annual Founders Day Banquet was held at the chapter house. Dean Fred Turner, Dean of Students, was the speaker for the occasion. Also, the chapter officers for the coming year were installed at the banquet.

The new chapter officers of Triangle are as follows: President, Dave Donnelly; Vice President, Ken Walters; Treasurer, Gerald Giffen, Corresponding Secretary, Bob Schrader; Recording Secretary, Harlon Schone; Commissary, Dick Brown, and House Manager, Harold Zahn.

## ITE

The Institute of Traffic Engineers held its regularly scheduled meeting on February 27 and officers for the spring semester were elected. President, Gerald Hann; Vice-President, Tony Calcattera; Secretary-Treasurer, Bob Cox.

After the election a short business meeting was held to discuss the Daniel Street project. Since this is strictly an engineering problem, data must be obtained and analyzed before the problem can be solved. In collecting data, members of the ITE, who are working in conjunction with members of C.E. 294 and C.E. 493, are taking counts on the volume, speed, turning movements, and parking along Daniel Street. These counts are taken both manually and mechanically. A radar speed meter is the only method used to determine traffic speeds. When all of the counts are in, a formal engineering report will be made. It will contain the problem, how it was analyzed, and how it can be solved. This report will be studied by city engineers and the city council will vote to accept or reject the proposals made. It should be noted that in making out the report, one must see what can be done legally. For instance, the city cannot change speed limits other than what the state law has designated.

After all aspects of the project were thoroughly discussed, the meeting was adjourned.

## AIEE-IRE

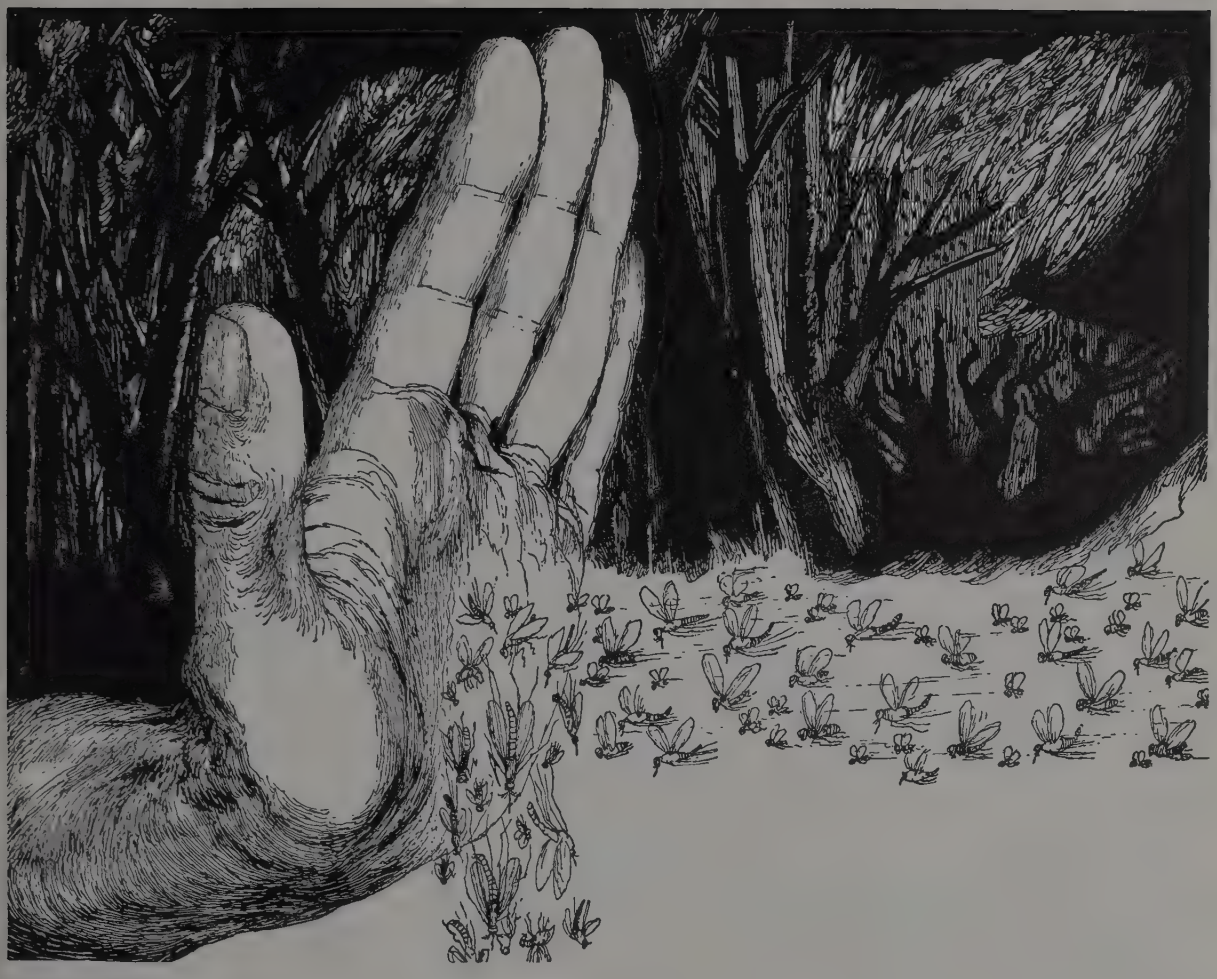
The second set of Electronic Ordnance lectures was held Wednesday, March 21, in the afternoon and evening. Mr. L. O. Brown of the EE department spoke on "Military Aspects of Servo-Mechanism."

Other meetings that the AIEE-IRE have had in the near past are a meeting April 3, at which a movie was shown entitled "Motors on Parade." This movie dealt with the construction and uses of motors and other Delco products. Another meeting was held on April 10, at which Mr. C. N. Hoyler of RCA spoke. Mr. Hoyler gave a demonstration lecture in which he showed a newly developed timer which will time intervals to the millionth of a second, and a device for solving up to five simultaneous equations. Refreshments were served in the EE lounge after the program.

## SBACS

The April meeting of the SBACS was held on the 17th in the Ceramics building. D. G. Bennett, Research Professor of Ceramic Engineering, spoke on the application of ceramics in aircraft power systems. Professor Bennett is the senior member of the Air Force research project which has been active in the department since 1943. Many of the members of the organization are remembering the

(*Continued on page* 24)



# *Bad News for Bugs*

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As a result, the people of Union Carbide are already providing allethrin in ever-increasing quantities to manufacturers of household and dairy sprays. And researchers all over the country are now engaged in testing its value for the control of agricultural pests and for other purposes. Other Union Carbide chemicals are important ingredients in many other insecticides and fungicides. One or more of them may have a place in your future plans.

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## NAVY PIER . . .

(*Continued from page* 10)

ridge and Guevrekian of the Urbana campus, Professor Gutnayer organized a field trip for April 10 to some of the outstanding North Shore Skyline Buildings still under construction. About one hundred Urbana and Navy Pier architecture students had the opportunity to hear Mies van der Rohe, of I.I.T., personally guide the tour of his twin apartment buildings at 860 Lake Shore Drive. Mr. Gunther of Pace Associates, the engineers on the job, gave a full technical description of the construction of this all steel and glass building labeled by Professor Gutnayer as a "vertical bridge," but it is still one of the important architectural achievements of the past few years.

The group of students also visited the 3410 Lake Shore Apartments, the design of which Professor Gutnayer has made at the opposite extreme of the all steel and glass building at 860. The building with its pleasing play of colors and textures is made out of structural materials applied in a variety of composition. The group also heard a thorough explanation by Professor Gutnayer, while on the premises, of the aesthetic concept of the building through the viewing of a model. It was an appreciative group who returned home that day after hearing two fine architects tell about the design of their buildings.

The society also had a field trip to the Sinai Temple on Chicago's South Side on April 21 in conjunction with the Chicago Chapter of AIA. It was a wonderful experience to see this outstanding building designed to accommodate a large public body.

### AIEE-IRE

The electrical engineering society had the pleasure of hearing Mr. J. E. Farley as their guest speaker at their April 4 meeting. He is employed as a television engineer by the Illinois Bell Telephone Company. The group was well pleased with his lecture and slides which told the story of the three methods of color television transmission, as well as their advantages and disadvantages.

This year, as per usual, the EE society prepared many interesting exhibits for the visitors to our Second Annual Open House, which was held on April 11 and 12. Under the guidance of Mr. W. K. LeBold, their club sponsor, they acquired many attractive displays. One of their outstanding displays was the Fun House where electronically controlled devices entertained the visitors. They also had a counter which showed that over 3,000 guests saw their exhibits.

The Black Light exhibit portrayed a small town nestled in a moonlight setting of nocturnal slumber. The people who had little knowledge of electronic circuits were pleasantly confused by a model train that would start, stop and reverse direction upon the verbal commands. The greatest enjoyment was found at the "oomphmeter" which checked your "oomph" in varying degrees from "nearly dead" to "fully charged." It seemed that a large percentage of our instructors are nearly dead. Another crowd stopper was where popcorn was being popped while still in the bag.

As a result of their efforts, the AIEE shared first place honors with AIA for the best engineering open house exhibit. The winners are entitled to keep the H. P. Hoelscher trophy, which is the circulating award given yearly to the best open house displays by the Engineering departments. In order to be sure that there will be no such ties in the future, the Engineering Council has organized a committee to make the eneces-sary changes in the rules of procedure for judging future contests for the award.

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### winches for logging

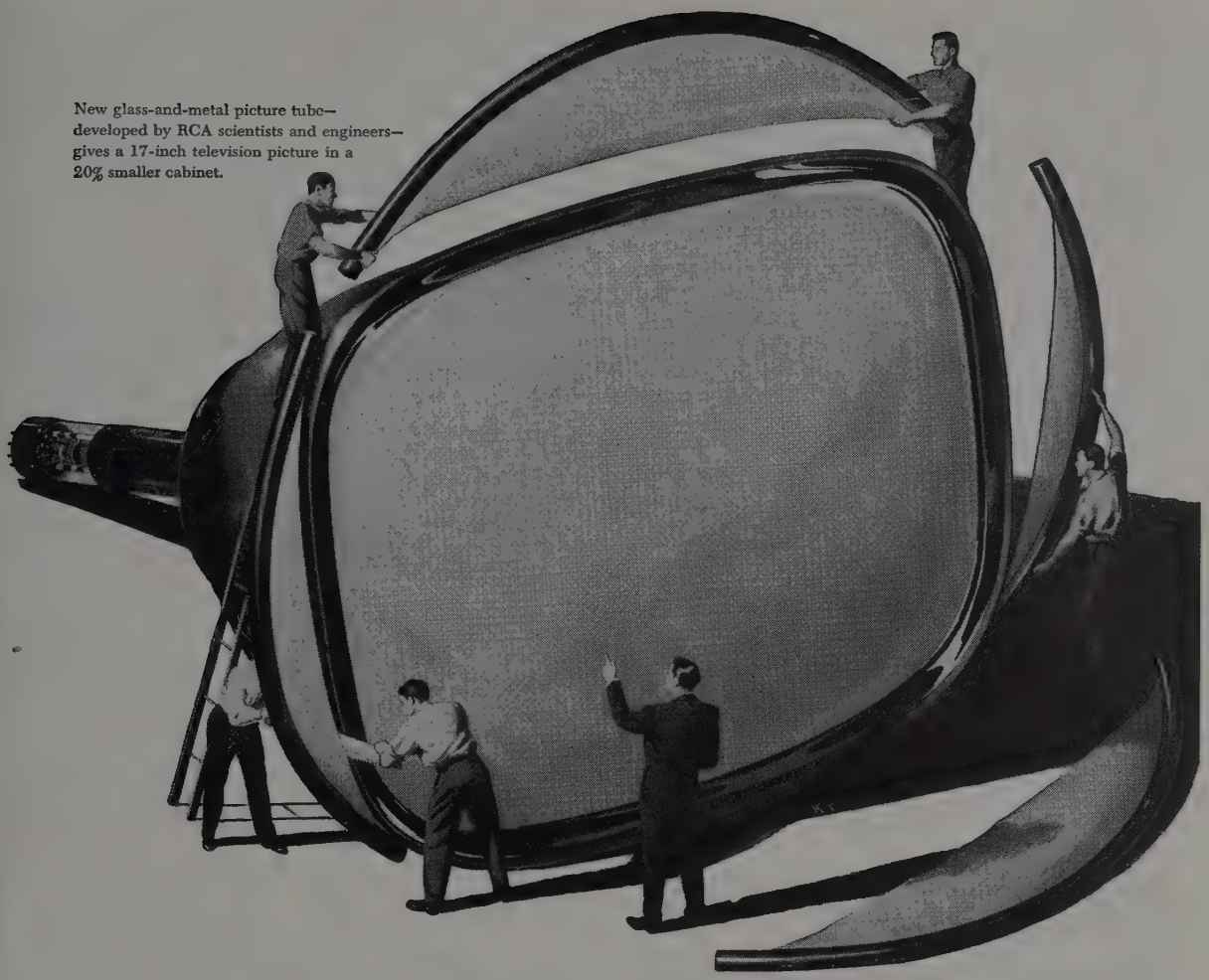
In extensive tests under the most difficult log skidding situations, the Oliver Wheel Tractor, and the revolutionary new Heller Winch have successfully proved to be one of the most versatile skidding unit combinations in operation.

The double drum type winch is installed between the tractor tires and the transmission case. It is virtually a built-in unit that will not upset tractor balance. These drums are operated by the tractor engine together, or independently of each other, and can be engaged or disengaged at will.

By using the tractor engine, clutch,

Recently the practical use of the Heller Winch has been proved in saw log operations in the Dismal Swamp in Virginia, and is now working effectively in French Guiana where fifty million cord *ft* of sawlogs have been skidded out of treacherous swamp lands. When used for the skidding of saw logs or tree-length pulpwood material, this versatile combination can quickly be moved to a new skidding site and be set up within 20 to 40 *min.*

and transmission to drive the drums, 12 forward speeds and four reverse speeds are obtained. Line speeds can be varied from 38 to 628 *ft min* with line pulls up to 36,000 *lbs* with a bare drum, which is slower than the average high lead operation. For this reason, it is not hazardous to work in the air as it does not do much damage to reproductive or residual trees left in logging even if 40 per cent is being cut.



New glass-and-metal picture tube—developed by RCA scientists and engineers—gives a 17-inch television picture in a 20% smaller cabinet.

# *Now—television "squares away" with a* **Bigger Picture**—*smaller tube!*

Ideal for mass production, compact, and lower in cost, RCA's glass-and-metal picture tube was a major advance in television history.

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## EAST CHEM . . .

(*Continued from page* 11)

efficient fractionating or distillation towers.

In addition to the two labs mentioned above, is the instrumentation and measurements lab. Here, prospective Chem. E.'s become familiar with industrial controllers and measuring devices. Some of these instruments include fluid-flow meters, pressure equalizers, temperature recorders and controllers, and various other instruments. This lab is furnished with regular industrial equipment.

No description of the East Chemistry building would be complete without mentioning the crushing and grinding room which houses pulverizing machines of a size regularly used in industry, and the various laboratories for undergraduate study. All these labs are equipped with the most modern facilities including hot and cold water, gas and compressed air outlets, and vacuum lines. Some of the labs have steam available at low, medium and high pressures. Up-to-date electrical facilities provide for convenient connections between desks and instruments located elsewhere in the lab. Several voltages are available, both AC and DC.

The main lecture room boasts a fully equipped projection booth. (Photo by Jules Altenburg)

For the bio-chems, the new building boasts a well equipped Kejldahl room. Here, the protein content of a substance is determined by a process involving the determination of the amount of nitrogen present in the substance. Also in the biochem section, accommodations for experimental animals are provided, and there is a Bio-Engineering lab under the direction of Dr. R. K. Finn.

In addition to the various labs, the building houses a number of classrooms, several rooms for individual research, various constant pressure and constant temperature rooms, and a variety of others designed for specific purposes.

The facilities of the building itself include a Duotemp heating system whereby each block of rooms has a central controlling thermostat for the blow-

(*Continued on page* 24)


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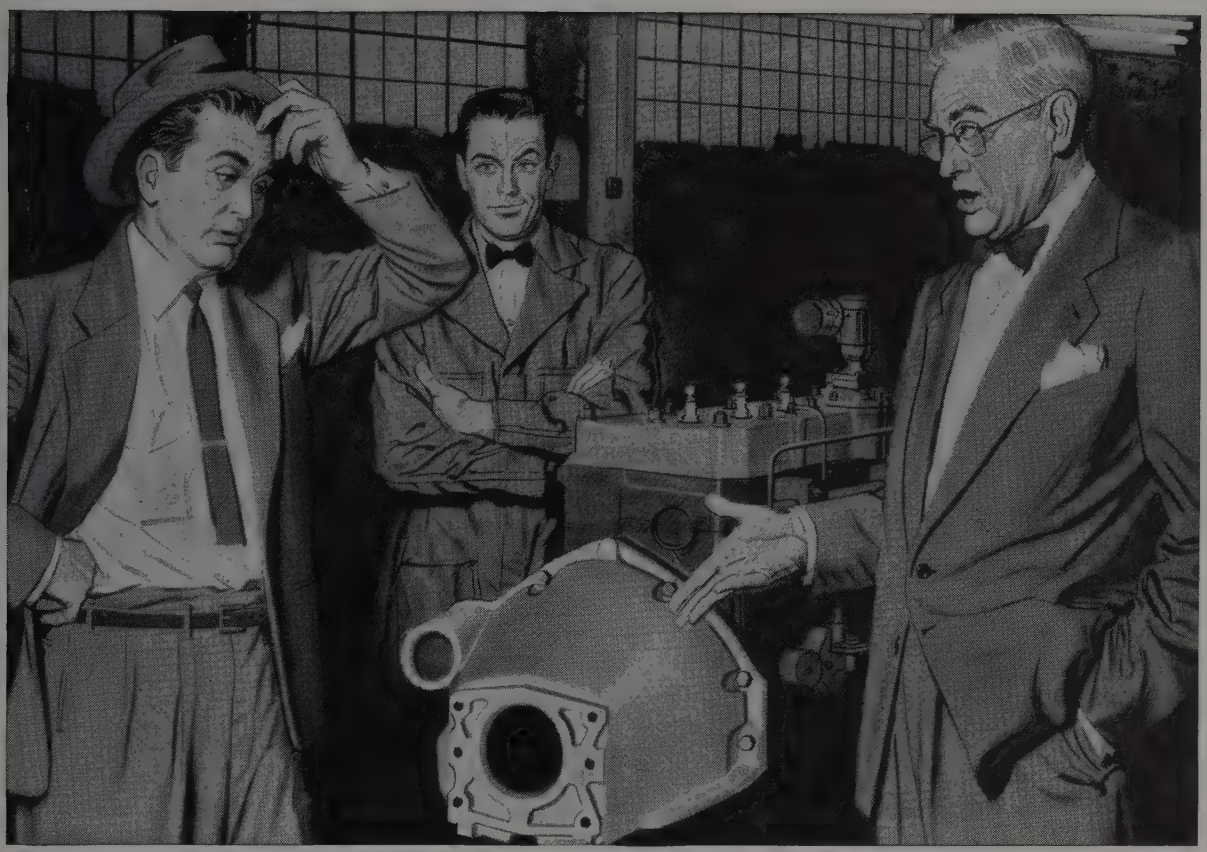


# Why can't this be an ALUMINUM DIE CASTING?

This challenge was thrown at us by a leading automobile maker.

"It's possible," we agreed. But . . . the clutch housing also supports half the engine's weight, it is highly stressed, must absorb vibration. Could a die casting economically be made that strong?

An Alcoa Development Program was started. With the auto maker we drew up designs. We selected our strongest die casting alloy; poured *sand castings* from it; machined it to the dimensions of the die casting design.

Shear static loads and bending stresses were measured. Brittle lacquer and strain gauges show us stress concentrations. Castings, engine and transmission were assembled, then run with an unbalanced shaft to measure dynamic stresses.

With the auto maker we modified designs. Die castings were made. We repeated the laboratory tests while the auto maker made road tests. The first stressed automotive die casting was a success. 25% stronger in shear, 10% stronger in bending, 100% better in fatigue life than the original clutch housing. Only ¼ as much weight as the original cast-iron housing. *And 15% lower in cost.*

This case is typical of the engineering problems Alcoa men undertake and solve. Throughout the Alcoa organization similar challenging jobs are in progress now and others are waiting for the men with the imagineering ability to tackle them.

ALUMINUM COMPANY OF AMERICA, 1825 Gulf Building, Pittsburgh 19, Pennsylvania.

*A business built on co-operation*

ALCOA®

ALUMINUM COMPANY OF AMERICA

## INTRODUCING . . .

(*Continued from page* 13)

Bact. 104, required in the sanitary engineering curriculum. Frank's advice to underclassmen engineers has become, "Go south, young man!"

Frank would like to return to school and do graduate work, but immediate plans call for work with the construction division of E. I. duPont de Nemours Company in Delaware.

### PROF. STANLEY G. HALL

Professor Stanley G. Hall, of the General Engineering Drawing Department, was born in Caribou, Maine. After graduation from high school in Dexter, Me., he attended college at the University of Maine and worked during the summers and vacations in a machine shop in Dexter. After his graduation from the University of Maine in 1923 he taught in the Engineering Drawing department of that university for two years. In 1925, he came to the University of Illinois as an instructor in the General Engineering Drawing department. He worked for the Maine highway department during the summers for several years after coming to the University. At the All-Engineers' Convocation in 1949, Professor Hall was presented an award for being

PROF. S. G. HALL

the most effective teacher in the GED department in a contest jointly sponsored by the Engineering Council and the *Illinois Technograph*.

Professor Hall is married and has two daughters, one of them graduating from high school this year, the other a sophomore in high school. His chief recreation is golf, which he plays occasionally. He is a member of Tau Beta Pi and the American Society for Engineering Education. He is also a member of the Urbana Town Club, the Shrine, the Masonic Lodge, and the Consistory. At the present, he is an officer in the Danville Consistory.

---

LIFE OF A JOKE

1 minute: Freshman thinks of joke while walking with his girl and tells it to her.

1 day: Joke circulates through girl friend's sorority house and engineer hears it.

1 week: Engineer claiming origination sends joke to TECH's joke man. Staff thinks joke abominable, but since deadline was three days ago and magazine is desperate, it is used in the TECH.

1 month: Joke appears at bottom of joke page. Feature editor is badly beaten about head and shoulders. Editor is kicked out of school.

---

"What was your score?" asked the golfer.

"Seventy-two," replied the novice.

"Seventy-two? Say, that's good."

"It's not so bad," agreed the novice. "I'm hoping to do better at the second hole."

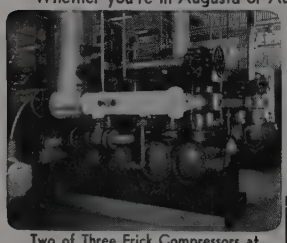
---

Conscience gets a lot of credit that belongs to cold feet.

**BIG AUSTRALIAN PACKING PLANT INSTALLS Frick Refrigeration**

The Queensland Meat Industry Board recently installed three Frick ammonia booster compressors for producing low temperatures at the Brisbane Abattoir. The Board says these big machines, each with four cylinders of 15" bore and 10" stroke, "have worked very efficiently," and have increased the output of the freezers at Brisbane by 26%. Annual capacity of the plant now approximates 250,000 cattle, 150,000 calves, 50,000 hogs, and 700,000 sheep and lamb.

Whether you're in Augusta or Australia, if you need air conditioning, refrigerating or ice-making equipment in commercial or industrial sizes, there's a Frick system to meet your requirements. Ask for recommendations and estimates.



Two of Three Frick Compressors at Brisbane

*The Frick Graduate Training Course in Refrigeration and Air Conditioning, Operated over 30 Years, Offers a Career in a Growing Industry.*

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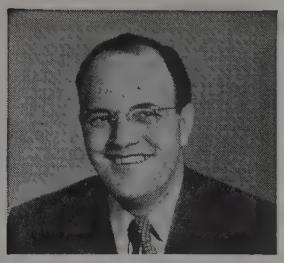
# The Most Important Job in the World



O. V. TALLY

*by* O. V. TALLY, *Manager, Midwest Region,*
*General Machinery Division,* ALLIS-CHALMERS MANUFACTURING COMPANY
*(Graduate Training Course, 1927)*

YOUR FIRST JOB is the most important job in the world. Picking that first job carefully can mean the difference between a running start in a really satisfying life work and merely working for a living. You must have been giving this problem a lot of thought as you look toward the end of your scholastic career. I had exactly the same problem while I was working for my E. E. at North Carolina State in 1925.

I happen to think that the man who applies his company's product in the field is the most important man in the American business system. Not only does he help create the demand that keeps our factories working, he is also the force behind many of the great improvements in products and processes which have been made. He must know and understand the customer's problems and the factory's facilities, then bring the two together to produce better goods at lower cost.

I knew I wanted this kind of work. Most of all, I wanted to be free to try several fields of work; to find out where my talents lay; to see where my individual effort would bring the greatest satisfaction.

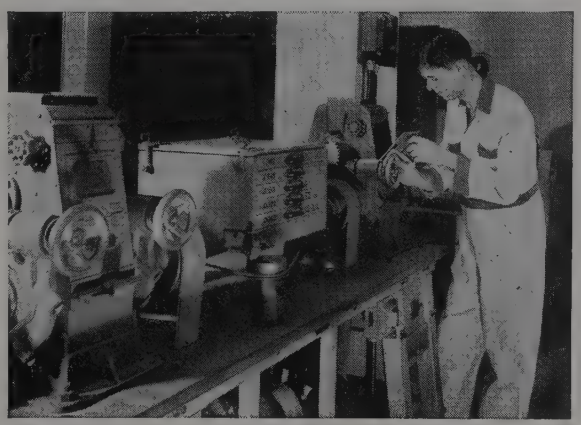
### Allis-Chalmers Serves All Industry

I chose the Allis-Chalmers Graduate Training Course because Allis-Chalmers has a hand in solving the problems of every basic industry . . . food, steel, mining, aluminum, electric utilities, public works, chemicals, and many others. Here I saw my chance to find out which I wanted to work in.

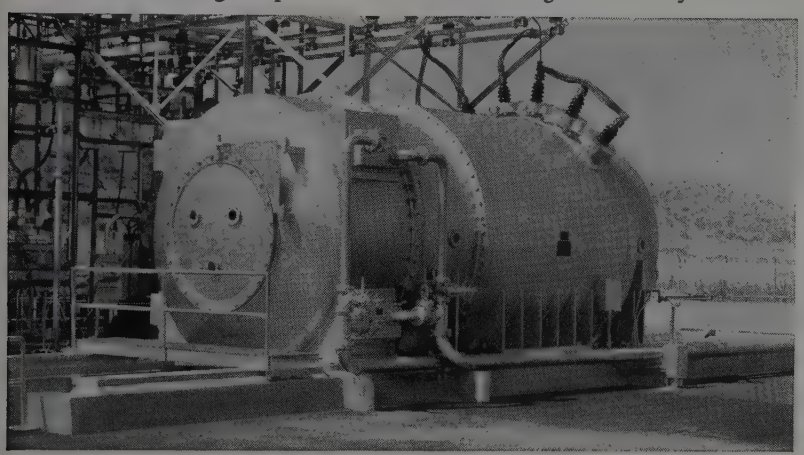
Taking the course in many different departments, I learned as much as I could about as many products and industries as I could. Then I began application engineering in the New York District Office. Since then, I have been in Washington, Philadelphia, St. Louis and Chicago. As it turned out, I didn't specialize in any industry, but worked on applications for all kinds of goods to many industries. And I found the work that has made me happy.

### Find Your Spot

Of course, not everyone wants to be a field application engineer. The Allis-Chalmers Graduate Training Course offers you an opportunity to find out which branch of industry you will be happiest in and which job in that industry you can do best. You choose your own courses and may alter them whenever you like. You choose among electric power generation, distribution and utilization equipment; motors, pumps, blowers; basic industry equipment for processing cement and rock products, ores, wood, chemicals, food; and many other types of equipment. You can get actual practice in design, manufacturing, sales, research, administration, service and erection before choosing which one to follow. And many Allis-Chalmers customers have openings for training course graduates.



**In Basic Industries** laboratory scaled-down equipment is used to investigate processes and make pilot runs. Lab includes complete food, ore, wood, rock products pilot plants.



**Large Allis-Chalmers** synchronous condenser corrects power factor on giant Southern California Edison Company distribution system.

As I've said, I believe the most important job in the world to you is your job after graduation. Choose the job that gives you the greatest opportunity for advancement through your own effort. If you want to talk to someone about the opportunities at Allis-Chalmers, visit your nearest Allis-Chalmers Sales Office. Or write Allis-Chalmers, Milwaukee 1, Wisconsin, for details.

**ALLIS-CHALMERS**

*Allis-Chalmers Manufacturing Company, Milwaukee 1, Wisconsin*

## SOCIETIES . . .

(*Continued from page* 14)

meeting of the parent society at the Palmer House in Chicago. This was the 53rd annual meeting and it was held April 22. A large number of the local chapter attended.

IAS

The University of Illinois Student Branch of the Institute of the Aeronautical Sciences held their April meeting on the 4th in Room 101 Armory. Chairman Corliss Laisure opened the meeting.

It was decided to have, in the future, a general meeting of all the students enrolled in Aeronautical Engineering and the Faculty. The purpose of this meeting was to get the students, especially the freshmen, acquainted with the faculty on an informal basis. Also, by means of this type of meeting, it is hoped that the interest and enrollment of the IAS will increase. Plans for the Spring picnic were discussed after which two interesting films were shown. The film titles are as follows: "Ground Control Approach" and "Survival in the Arctic." The meeting was closed in form.

## EAST CHEM . . .

(*Continued from page* 20)

er system, while there is an individual thermostat in each room for radiator control. A double-pipe water cooling system supplies drinking water at a comfortably low temperature.

The building's interior is constructed of light-weight cinder block which greatly reduces the noise level within the building. The main lecture room boasts a fully equipped projection booth for the best possible presentation of audio-visual aids.

Most of the work on the building has been done by Illinois alumni. The architectural work, the heating installation, the plumbing, and the electrical wiring were all done by or in cooperation with alumni of the University. Congratulations are in order for all these men for the fine work of engineering that is the East Chemistry building.

---

Garageman: "How did you happen to puncture the tire?"

Motorist: "I ran over a milk bottle."

Garageman: "Didn't you see it?"

Motorist: "No, the kid had it hid under his coat."

## super vacuum bottle

A vacuum bottle that can hold the world's coldest liquid 15 times longer than the best container previously available has been developed.

Dr. Aaron Wexler, head of Westinghouse low-temperature studies, revealed perfection of a copper vacuum bottle that will hold four gallons of liquid helium — used by scientists in studies of materials at sub-zero temperatures—at a temperature of only eight degrees above absolute zero (-459.8°F) for 100 days.

The new vacuum bottle consists of two highly polished copper spheres—one inside the other—about a foot in diameter. Most of the air is evacuated from the area between the two spheres. The bottle is immersed in a tank of liquid nitrogen at a temperature of -300°F to minimize heat losses.

Heart of the new device is contained in the long narrow neck tube through which the liquid helium is poured. Since practically all of the heat transmitted into the interior of the bottle is conducted down the surface of the neck tube, the scientist designed the neck to cut these losses to a minimum. This was done by making the tube slightly more than a half-inch in diameter, increasing its length, and using thin-walled metal. Through such design, the heat inflow was reduced by 90 percent.

What happens is that the super-cold helium vapors coming from the container serve to refrigerate the neck tube. This essentially neutralizes the transmitted outside heat and thereby narrows the temperature gap between the tube and the helium. By improvements in the design of the tube, it was predicted that even more efficient containers could be developed.

---

Marriage is like a three ring circus: engagement ring, wedding ring, suffering.

* * *

1st roommate: "Whatcha got there roomie?"

2nd roommate: "A gallon of whiskey."

1st roommate: "How come?"

2nd roommate: "Going on a hike in the woods. Protection for rattlesnake bite."

1st roommate: "Whatcha got in the box?"

2nd roommate: "Rattlesnakes."

* * *

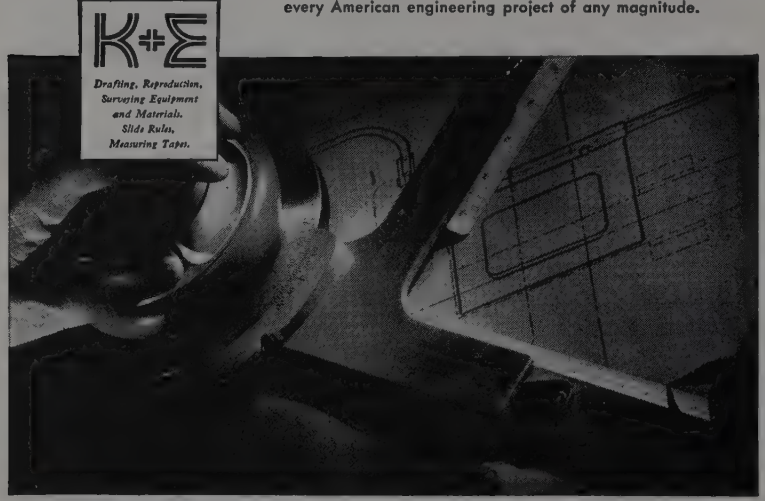
Hickory dickory dock
Two mice ran up the clock
The clock struck one
The other one got away.

* * *

Before I could tell him I wasn't that sort of a girl, I was.


# partners in creating

**K & E drafting instruments, equipment and materials have been partners of leading engineers for 81 years in shaping the modern world. So extensively are these products used by successful men, it is self-evident that K & E has played a part in the completion of nearly every American engineering project of any magnitude.**

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# —to 20,000 lbs. over Korea

"CALIFORNIA 73" was the popular name of the best aviation gasoline ever produced before the day of synthetic additives. It was the best fuel obtainable for the pre-World War I planes that used it. But today it couldn't get one of the Army's newest heavy transport planes off the ground.

These new monsters wing westward across the Sea of Japan, carrying cargoes of 20,000 lbs., or 64 infantry troops, and at 18,000 feet fly at over 200 m.p.h. Quite a lift! And their engines demand fuel with performance ratings far beyond the properties of any gasoline that can be separated directly from crude.

The most significant difference between "California 73" and the gasolines in use today is synthetics of one kind or another. These man-made petroleum synthetics blended into modern gasolines have yielded performance ratings undreamed of little more than two decades ago. We have them now thanks to research—in which Standard Oil has been a leader.

The technically trained men who work in Standard Oil's research laboratories and pilot plants cannot foretell future developments in gasoline. But of one thing they are certain: it is synthetics that will make possible tomorrow's even better aviation gasolines. And when better gasolines are made, research men will help make them.

## Standard Oil Company

910 South Michigan Avenue, Chicago 80, Illinois

STANDARD

## COMFORT . . .

(*Continued from page 9.*)

connected with a duct system through which the air is forced to the rooms. These summer air conditioning units may be floor-mounted or hung.

Winter and summer air conditioning systems are integrated in many residential installations to produce a year-around air conditioning system. To provide air conditioning in old structures a summer air conditioning system is added to the winter system already installed. The installation of a summer air conditioning system to a heating system does not produce year-around air conditioning unless the heating apparatus functions as a winter air conditioning system. In new residences both winter and summer air conditioning units are installed with ducts to provide air conditioning. In new residences air conditioning can be effected by the installation of a unit that contains all the component apparatus necessary for winter and summer air conditioning, or separate winter and summer packaged units can be installed with ducts to the system.

Industry provides the homeowner with packaged air conditioning units (winter and/or summer) that are readily installed, economical in initial cost and maintenance, and satisfactorily produce desired conditions. Residential winter air conditioning has been accepted by the homeowner and constitutes a large number of the heating systems being installed in residences. Residential summer air conditioning is increasing in popularity with the homeowner because of the increased production of low cost units.

## VIKING . . .

(*Continued from page 7*)

gen. Every fifteen minutes the loudspeaker announces the remaining time till "X".

The gantry crane is then rolled away and the Viking stands for flight—tipping 2½ degrees to the north. Small plumes of oxygen escape from the nose indicating that the tanks are full. A nearby pole supports the power line that is attached to the rocket's nose to supply external power upto firing time.

By this time everyone has filed into the blockhouse and the count changes to five minute intervals. Stations from every part of the 90-mile-long testing range report in their readiness to track the flight and report the landing.

At a station three miles south of the launching sight are men trained to follow the rocket's flight with 20-power telescopes. An "impact computer" activated by the swing of the telescope automatically plots on a map the landing point. This station can order the power to be cut if the rocket veers too near the edge of the range.

As the count moves down, the major flight divisions—instrumentation, radar tracking, sound tracking, power cut-off, rocket controls, and telemetering— signify their readiness for the flight by a series of control panel lights switching from red to green.

With 20 minutes remaining, the count changes to one-minute interval and a red flare is set off. At "X-minus two minutes" a Very flare flashes overhead. The last 20 seconds are counted off and the red firing button is pressed on the count of five. An electric current surges to the rocket and energizes a pyrotechnic pinwheel which ignites the rocket fuel. The power cable drops and there is a deafening roar as bluish red flame blasts into the concrete pit beneath the launching stand. The Viking trembles as it lifts slowly the first few feet. Then it accelarates rapidly for its trip into the ionosphere.

The short climatic flight of the Viking ends its life, but the information it gleans in those few minutes will probably be studied for many months and will have far reaching imlpications.

***When the country's largest railroad loudspeaker system*** was planned in the Baltimore and Ohio's yards near Chicago, the choice of cable to be used was a key factor. With 37 miles of underground cable involved, subsequent maintenance costs could conceivably be a major item if any but the best cable were to be used.

Okonite cable was chosen for this job because of its superior rubber insulation and the resistance of its Okoprene sheath to alkalis, acids, oils and other corrosive substances encountered in railroad yard installations. Today, 197 two-way loudspeakers, 50 paging speakers, a complete telephone and printing telegraph system, and an independent inter-communicating system between offices in the yard are operated over Okonite cables in this network.

● ● ●

Tough jobs are the true test of electrical cable . . . and installations on such jobs usually turn out to be Okonite.

OKONITE SINCE 1878 *insulated wires and cables*

8783

# Engineers . . .

***Watch for the October Issue***

***of the***

# TECHNOGRAPH

★

**SPECIAL**

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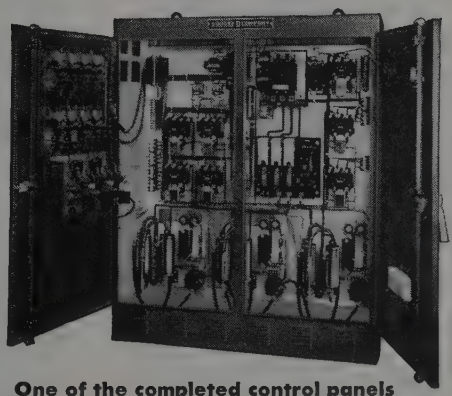

**One of the completed control panels**
*Because Square D's line of control is so complete, this entire unit was designed using only standard devices, accessories and electronic sub-assemblies.*

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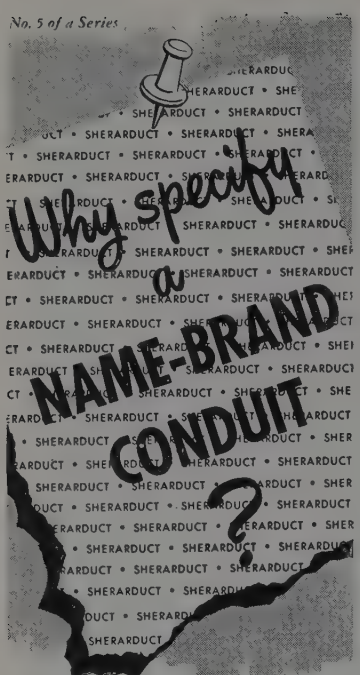



**Brand names are important. Only the *finest* products carry them, because only the finest products warrant the time and expense necessary to support them.**

**Brand names are doubly important to you who will be called upon to recommend or specify certain products in your professional career. To safeguard your own reputation, you will want to know you have specified the *best.***

**Sherarduct is the outstanding name in rigid steel electrical conduit. It has stood the test of time in all types of installations and under the most severe conditions. For more than 40 years, architects, engineers, and contractors have relied on it for *permanence in wiring,* because a Sherarduct installation will "last as long as the building stands."**

EVERYTHING IN WIRING POINTS TO

National Electric
PRODUCTS CORPORATION
PITTSBURGH, PA.


## SKIMMING . . .

(*Continued from page* 2)

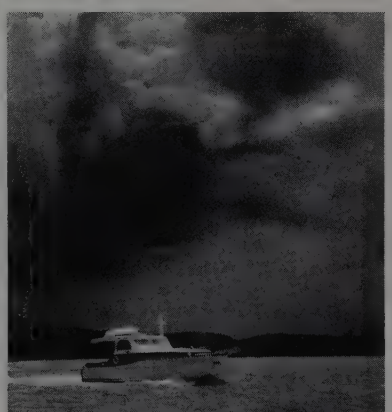
ly 1500 watts of power. With modifications now under way, it may be possible to increase this output by as much as six or seven times.

Greater power will mean complete coverage and greatly improved reception, the scientists pointed out.

The Resnatron achieves its ultra-high frequencies by oscillating electrons until they move back and forth hundreds of millions of times a second. Emitted from several heated filaments and traveling in "bunches" spaced slightly more than a billionth of a second apart, the electrons reach a part of the tube called a resonant cavity — a hollow, copper walled space that oscillates at a particular high frequency when excited by electrons traveling at the same high frequency.

The unique feature of the converted Resnatron is its "reflex" action. As the electrons speed from the heated filament, accelerated by 10,000 volts of electricity, they meet a "repeller" that turns them around and directs them back to the positive screen of the tube.

This increased length of travel enables the reflex Resnatron to transmit in bandwidths wide enough to carry all the information needed for good, clear color-television detail. Further experiments may make possible even wider bandwidths.



Well-grounded lightning rods protect the "Marilyn." (Courtesy of Westinghouse)

### lightning rods for pleasure boats

Lightning statistics say a 30-foot pleasure boat will be struck by lightning once in 30 years on an average. But a Westinghouse engineer, and a boating enthusiast, has recently shown how a few feet of copper wire will fully protect the craft from danger. A series of demonstrations conducted in the Westinghouse high-voltage laboratory, where a three-foot model of a pleasure boat was subjected to repeated strokes of 3-million-volt man-made lightning, shows that simple precautions will divert lightning currents harmlessly into the water with no injuries to boat or occupants.

Small boats will be protected from lightning damage if a copper wire is run from a sufficiently high point such as a mast to any metal object that is in contact with the water, such as the rudder. Lightning will follow the wire and be conducted safely into the water.

Sailboats generally have a mast high enough to offer a sufficient cone of protection. Anything within this cone, whose base has a diameter equal to the height of the mast, will be protected by the mast. A length of aluminum tubing will give the necessary height.

Number 4 copper wire is recommended for protecting a boat. While it is slightly larger than necessary for adequate protection, it is better able to withstand corrosion and vibration and will need little or no subsequent inspection or replacement.

Swimming during lightning storms is particularly dangerous since lightning currents may travel many feet through the water before being completely dissipated.

---

Alumni entering frat house. "May I come in?" he said. "It's the room I had when I was here in '09."

"Yes sir," he continued, "same old windows, same old view of the campus, same old closet." He opened the door. There stood a queen, greatly embarrassed, however.

"This is my sister," the student quickly said.

"Yes sir, same old story."

* * *

E.E.: "Where did you get that date?"

M.E.: "Why, she is one of the campus queens."

E.E.: "Buck teeth, cross eyed, bleached hair . . ."

M.E.: "You needn't whisper—she's deaf, too."

* * *

The reporter had been told over and over that his stories were too long winded, so his next write-up came into the copy desk. "J. Smith looked up the elevator shaft at the Palace Hotel this morning to see if the elevator was on its way down. It was. Age 45."

* * *

"I shall now illustrate what I have on my mind," said the professor as he erased the blackboard.

# Oh say can you see-

"That's Jonesey—putting out his flag again.

"He hasn't missed one Sunday in the eight years we've been neighbors. I used to kid him about it a lot. Asked him why didn't he buy a cannon to shoot off with it. He took it good-natured-like. But we got to talking last week about war in general. That was the first time I even knew he had a son.

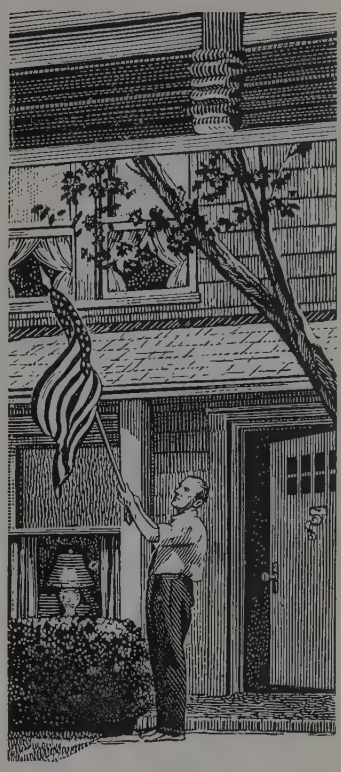
"His boy, Joe, enlisted right after Pearl Harbor and got overseas fast. When young Joe came back, Jonesey met him at the railroad station, stayed up with him all night and rode out with him to the cemetery on the hill. After it was all over, the sergeant gave Jonesey the flag that had covered Joe. *That's it over there.* I don't kid Jonesey any more.

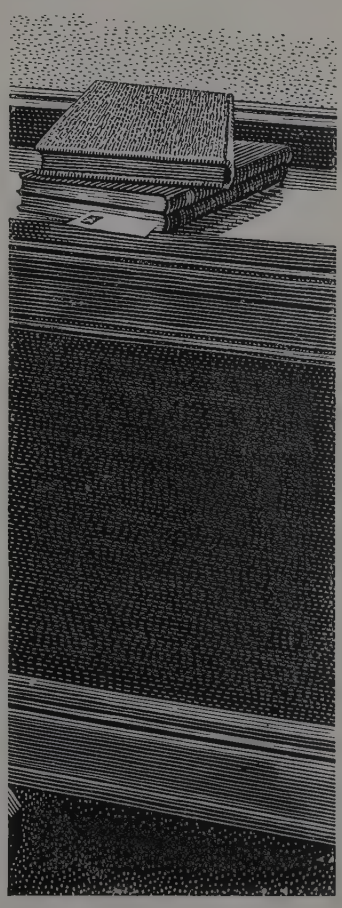
"Instead, I've been listening respectfully when he talks about the flag . . . only when *he* says it, it's Flag. With a capital F. Same capital F he puts on Freedom, which is what he really means. Jonesey sure made me think about Freedom a lot. For instance . . .

"When I vote, nobody knows where I put my X's. Nobody puts me in jail for picking out my own church. And no teachers tell my kids to spy on me and turn me in because I squawk about taxes or high prices. And when I told my boss I was quitting to open a little grocery with the dough I'd saved in war bonds, he wished me luck and said he'd have his missus buy their groceries from me.

"*That's* what Jonesey meant when he said our Freedom is right under our noses. Can't feel it or see it. But it's there just the same, wrapped up in every star and stripe in that Flag across the street.

"And, if you'll excuse me, I'm going outside and hoist *my own* Flag, too . . . just bought it last night. 'Oh say can you see?' *I sure can . . . now!*"





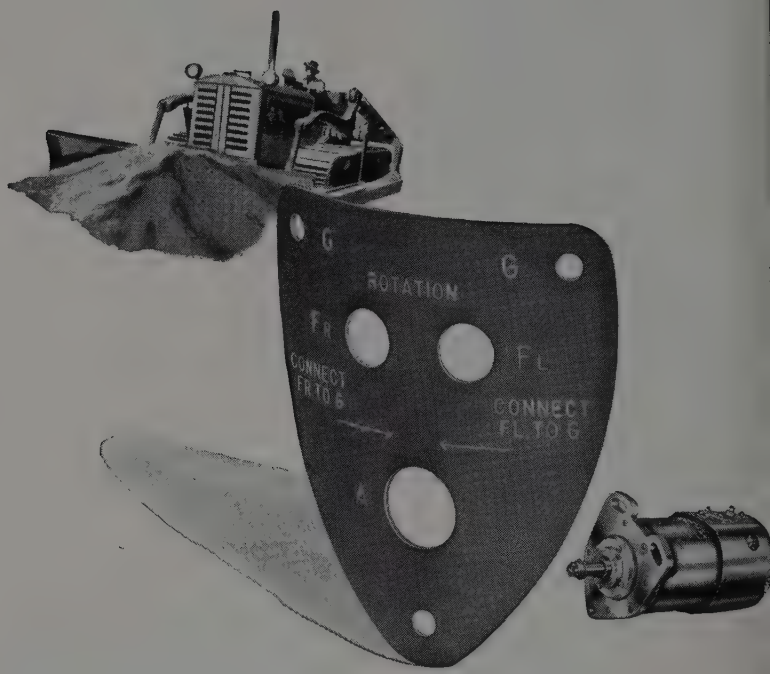
# REPUBLIC STEEL

**Republic Building, Cleveland 1, Ohio**

***Republic BECAME strong in a strong and free America. Republic can REMAIN strong only in an America that remains strong and free*** . . . an America who owes much of her prosperity to her many huge industries that provide her people with the world's finest living. *Through these many industries, Republic serves all America.* A typical example can be found in the Petroleum Industry whose products furnish much of the nation's power, heat and light. In this production, too, steel plays a vital role . . . carbon, alloy and stainless . . . much of which comes from the many mills of Republic.

* * *

For a full color reprint of this advertisement, write Dept. H, Republic Steel, Cleveland 1, Ohio




## How to move mountains—non-stop

When it comes to moving mountains—or spreading the landscape around—you can't beat bulldozers.

You can, however, beat a bulldozer if you put into it a part that can't stand the gaff.

An example is the generator. Vibration, abrasive dust, weather, shifting stresses and stray oils or greases are constantly taking their hardest licks at it. It leads a tough life.

That's why American Bosch Corporation, makers of dust-proof, heavy-duty generators for industrial tractors and bulldozers, selected Synthane laminated plastics for the insulation plate shown above.

Synthane is a material for industry. It possesses an unusual *combination* of physical, mechanical, chemical and electrical properties.

Synthane is light, strong, dense, abrasion resistant. It is easily machined or produced in formed shapes. Dielectrically strong, it is a natural for electrical applications. Synthane is corrosion and fungus resistant, chemically inert, stable over a considerable temperature range.

If this capsule description of Synthane piques your imagination, send for the complete Synthane catalog. Synthane Corporation, 10 River Road, Oaks, Pennsylvania.

PLASTICS WHERE PLASTICS BELONG

SYNTHANE

# EVER HOLD HANDS LIKE THESE?

They're not soft and warm, these hands. They're hard and cold — and mechanical. They work at the Oak Ridge atomic energy plant, preparing radioactive isotopes for shipment to Bell Telephone Laboratories and to other research centers.

These isotopes — which serve as tracers — are used by Bell scientists to study the materials that go into the telephone system. Our research men, working with Geiger counters, are able to detect wear in relay contacts, impurities in metals, the penetration of preservatives in wood.

This new research tool helps us to learn more in less time, helps us to make telephone equipment even more rugged and dependable. That's especially important right now when the Nation relies on the telephone to help get things done.

BELL TELEPHONE SYSTEM

# CANTER POLL

**By BOB SAJBEL**

*(Reprinted from the Iowa Engineer)*

SUBJECT:
*Flying Saucers.*

Have you seen any? Yes..... No.....
If you answered yes, fill out form below.

Name..... Address..... Married?.....

Social Security Number..... Service Serial Number.....

Any Children?..... Annual Income.....

PHYSICAL CONDITION:

*Eyes;*
- Blind .....
- Cross-eyed .....
- Near-sighted .....
- Far-sighted .....
- Astigmatic .....
- O.K. .....

*Mood or State;*
- In Love .....
- Intoxicated .....
- Before Finals .....
- After Finals .....
- (If Arch or Arch E.)
- After Problem .....
- Neither .....

*Before the instance of my observation, I thought that the Saucer reports were:*
- Crazy .....
- True .....
- Red Scare .....

*When I saw the Saucers I was:*
- Mildly surprised .....
- Shocked .....
- In the sack .....
- At Bidwell's .....

*Shape of Saucers:*
- Round and Flat .....
- Ellipsoids .....
- Ovalloids .....
- Square .....

*Were the Saucers you saw:*
- Fast .....
- Slow .....

*I am:*
- An Engineer .....
- A Peasant .....

*Sketch your impression of a Flying Saucer.*

PLAN ELEVATION CROSS SECTION INTERIOR POWER PLANT OCCUPANT

*If a saucer landed in the permit parking lot, would Stoddard:*
- Shoot the pilot .....
- Give him a ticket .....
- Ask for a ride .....
- Run .....

How long have you been at the U. of I? Years..... Months..... Days.....

Is there any insanity in your family? Yes..... No.....

# *Which of these* Refractories *withstands the* Highest *temperature?*

If you answered "Stabilized Zirconia*" you're right up to the minute on the latest developments in the refractory industry. Norton Fused Stabilized Zirconia . . . an amazing new refractory . . . withstands temperatures up to 4500°F. Because it makes higher temperature ceilings possible, Norton Stabilized Zirconia opens the doors to new technical advances in the processing field . . . has already speeded up gas synthesis production by a profitable margin.

## *Other Extraordinary Properties*

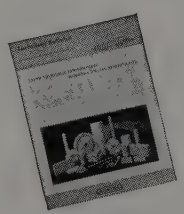
No other refractory offers such an unusual combination of properties. Norton Stabilized Zirconia has a *surprisingly low thermal conductivity.* In spite of the fact that its specific gravity is twice that of fire clay brick, its thermal conductivity is only 6 (English Units) as compared with fire clay's 12, fused alumina's 20± and silicon carbide's 50+.

Even more amazing is the *electrical resistivity* of Norton Fused Stabilized Zirconia . . . ranging from 2300 ohm-cm at 1300° F to 0.37 ohm-cm at 4000°F. Yes, it's just the opposite to the usual rule that resistance increases with the temperature.

Equally valuable to processing industries is the *chemical stability* of Norton Stabilized Zirconia, manifested in its ability to resist both oxidizing and reducing atmospheres at high temperatures and its chemical inertness in contact with titanates.

## *Thinking of Your Future?*

First to produce Fused Stabilized Zirconia in commercially significant quantities, Norton keeps on "making better products to make other products better" through constant work on new developments. To do this requires new ideas and fresh approaches in the field of research . . . a hint to young engineers and chemists. When you think of your future, think of Norton.



## *New Bulletin*

describes the amazing properties of Norton Fused Stabilized Zirconia in full detail. Write for a free copy.

Neil Ault, Ph.D., Ohio State '50, measures the resistance to deformation of Crystolon* (SiC) refractories at high temperatures in multiple load test furnace.

*Trade Marks Reg. U. S. Pat. Off. and Foreign Countries

NORTON

TRADE MARK REG. U. S. PAT. OFF.

*Making better products to make other products better*

ABRASIVES · GRINDING WHEELS · OILSTONES · ABRASIVE PAPER & CLOTH

GRINDING & LAPPING MACHINES · LABELING MACHINES · NON-SLIP FLOORING

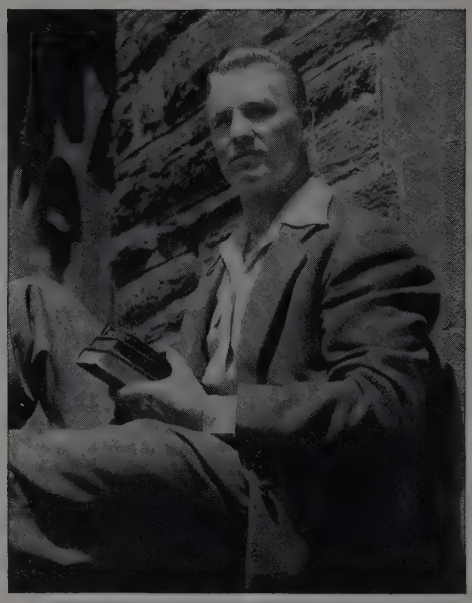
REFRACTORIES · CERAMIC SURFACE PLATES · BORON CARBIDE PRODUCTS

NORTON COMPANY, WORCESTER 6, MASSACHUSETTS

BEHR-MANNING, TROY, N. Y. IS A DIVISION OF NORTON COMPANY

# YOU REMEMBER LOU . . .

## *He'd Give His Eye Teeth For This Opportunity*



Lou came out of W. W. II with the bug for electronics. He'd been an electronics maintenance specialist in the Navy . . . attended service schools in radar, sonar and gunfire control to earn his petty officer's rating. He came to school under the GI Bill . . . majored in electronics . . . now has his degree in electrical engineering. Lou is doing all right now but wishes he could be closer to his chosen career — *electronics.*

*Maybe you know Lou—or somebody like him. Perhaps you yourself have a similar background and can qualify for this unusual opportunity to secure broad foundational experience in the rapidly growing field of electronics engineering.*

## RAYTHEON GOVERNMENT FIELD ENGINEERING

GOVERNMENT FIELD ENGINEERING is our name for the Raytheon organization which supplies world-wide technical service to the Government relative to the intricate electronic equipment which we manufacture. This highly qualified group has won an acknowledged eminence among similar organizations. During World War II, Raytheon produced more search radar for the Navy than all other manufacturers combined. Its Submarine Signal Division has been the leader in sonar and underwater sound since 1901.

Since V-J Day, Raytheon has continued in all phases of electronics development and production for the Army, Navy and Air Force, and is now being called upon to gear its facilities to the growing needs of the Armed Forces. We now have a limited number of openings for candidates who have the special service and educational background required and who can meet the rigorous qualifications which we must impose in order to maintain our high operating standards.

### JUNIOR FIELD ENGINEER

Successful applicants for the position of Junior Field Engineer in the Raytheon Government Field Engineering Organization will have the same general biography as our friend, "Lou". Military experience with electronic equipment in the Army, Navy or Air Force is desirable. A degree from a school of Physics or Electrical Engineering in a recognized college or university is essential. Experience after graduation is of little consequence.

The position of *Junior Field Engineer* presents a rare and unusual opportunity to become acquainted with the most modern techniques in the science of electronics. For the graduate engineer, it is a once-in-a-lifetime chance to familiarize himself with the many phases of electronics prior to specialization.

Junior Field Engineers are called upon to (1) supervise equipment installation, (2) supervise or personally attend to its repair and maintenance, (3) train military or other qualified personnel to operate, repair or maintain it, and (4) contribute toward the solution of engineering problems which may arise in the field. The Junior Field Engineer may be called upon to undertake important missions of a classified nature in the interests of the Government. He will at all times, by the nature of his position, be a representative of the Raytheon Manufacturing Company responsible for sustaining and improving our relationship with and service to the Government.

SALARY AND BENEFITS are liberal, commensurate with the technical knowledge and skill and the responsibility involved. They include travel and subsistence payments, free accident insurance, low cost life insurance, retirement and hospitalization plans. All in all, this adds up to a job for which only a relatively small group of engineers can qualify, but in which successful applicants can profit more professionally and financially, can advance more rapidly, and can acquire a wider range of valuable and interesting experience than in any other branch of the industry.

### WHO CAN QUALIFY?

Practicing engineers, recent graduates and those about to graduate are eligible to apply; preferably those between the ages of 22 and 30. If you know of a qualified applicant, you will be doing him a tremendous favor by calling this opportunity to his attention. All applications will be carefully considered and held strickly confidential. Send a brief resume to

*Government Field Engineering*

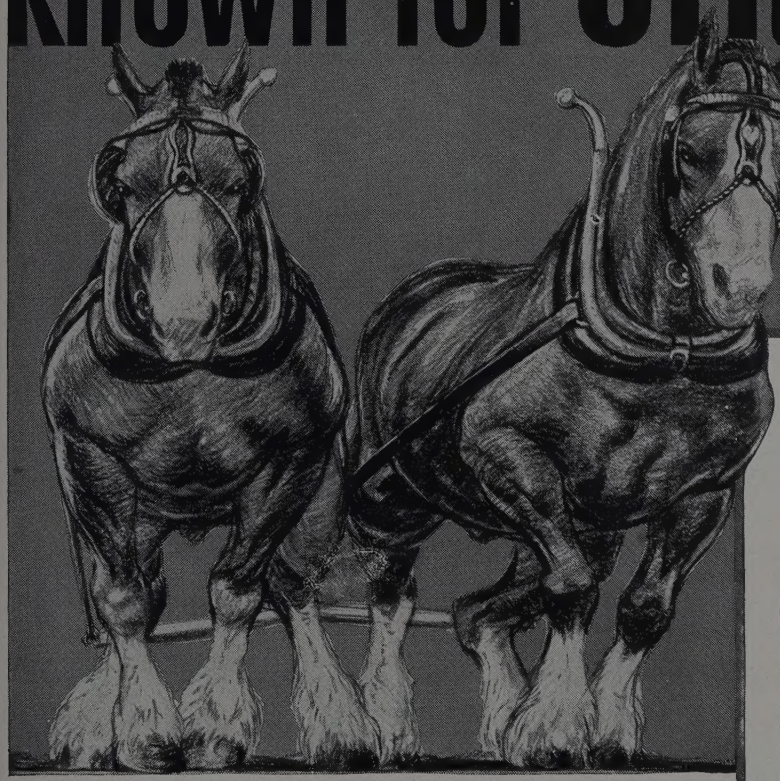
**RAYTHEON MANUFACTURING COMPANY**

**138 RIVER STREET • WALTHAM 54, MASSACHUSETTS**

RAYTHEON

*Excellence in Electronics*

# known for STRENGTH



## In city streets lay pipe known for STRENGTH

### CRUSHING STRENGTH

The ability of cast iron pipe to withstand external loads imposed by heavy fill and unusual traffic loads is proved by the Ring Compression Test. Standard 6-inch cast iron pipe withstands a crushing weight of more than 14,000 lbs. per foot.

### BEAM STRENGTH

When cast iron pipe is subjected to beam stress caused by soil settlement, or disturbance of soil by other utilities, or resting on an obstruction, tests prove that standard 6-inch cast iron pipe in 10-foot span sustains a load of 15,000 lbs.

### SHOCK STRENGTH

The toughness of cast iron pipe which enables it to withstand impact and traffic shocks, as well as the hazards in handling, is demonstrated by the Impact Test. While under hydrostatic pressure and the heavy blows from a 50 pound hammer, standard 6-inch cast iron pipe does not crack until the hammer is dropped 6 times *on the same spot* from progressively increased heights of 6 inches.

### BURSTING STRENGTH

In full length bursting tests standard 6-inch cast iron pipe withstands more than 2500 lbs. per square inch internal hydrostatic pressure, which proves ample ability to resist water-hammer or unusual working pressures.

Known strength factors! Proved resistance to corrosion! These are your only safe and sure guides to long life and low maintenance expense of water, gas and sewer mains laid under costly modern pavements. The four strength factors that pipe must have to survive traffic shocks, heavy external loads, beam stresses and severe working pressures are listed in the box opposite. *No pipe that is deficient in any of these strength factors should ever be laid in paved streets of cities, towns and villages.* Cast iron water and gas mains, laid over a century ago, are serving in the streets of 30 or more cities in North America. These attested service records prove that cast iron pipe not only assures you of effective resistance to corrosion but all the strength factors of long life and economy, as well.

CAST IRON

CAST IRON PIPE RESEARCH ASSOCIATION, THOS. F. WOLFE, MANAGING DIRECTOR, 122 SO. MICHIGAN AVE., CHICAGO 3.

**CAST IRON PIPE SERVES FOR CENTURIES**

# How Honeywell Controls help discover what it's like 90 miles straight up

The U. S. Government uses V-2 rockets to explore the upper atmosphere. Sensitive instruments in these rockets record vital data about atomic fission, cosmic rays, weather and many other phenomena of practical value.

Obviously, every part of these instruments must be especially accurate, dependable and *rugged.* That's why a Honeywell Micro Switch was chosen to control the motor in the V-2's special camera. Directed by this one-ounce switch, the motor causes the film to shift eight times, then closes the unit for protection against the enormous impact of landing.

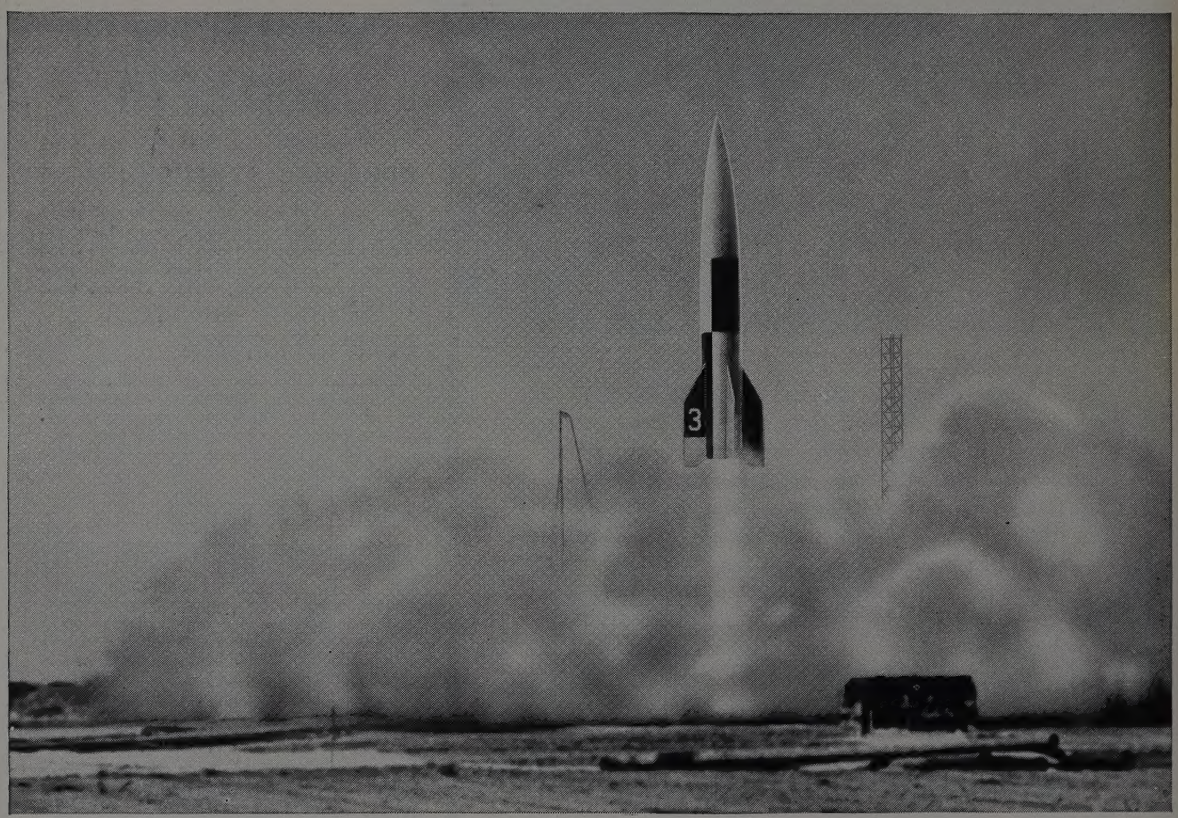
This small but necessary function is only one of the many jobs Honeywell Controls now perform in the all-important fields of atomic energy, guided missiles and aviation.

Today, fabulous new control devices in these and other fields are being developed by the men in our expanding engineering and research sections. Many of these workers are keen-minded young men only recently graduated from the universities.

Equipped with the latest scientific instruments, they find their work at Honeywell provides the kind of challenge they are looking for, often calls for fascinating research in the realm of pure science.

This is the age of Automatic Control—everywhere you turn.

And Honeywell has been the recognized leader in *controls* for more than 60 years!

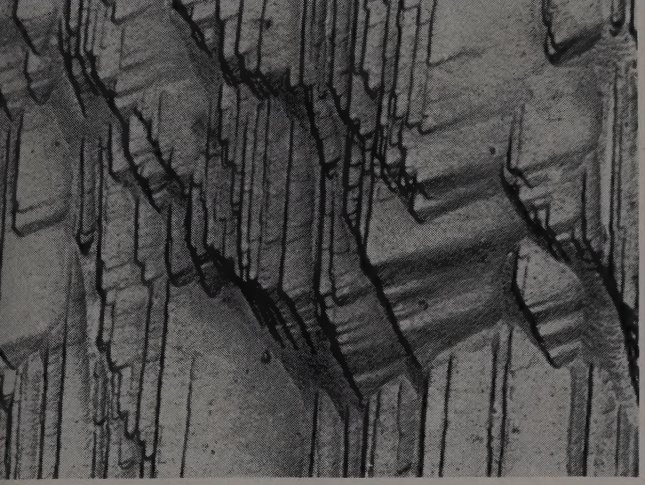



America lives better—works better with Honeywell Controls

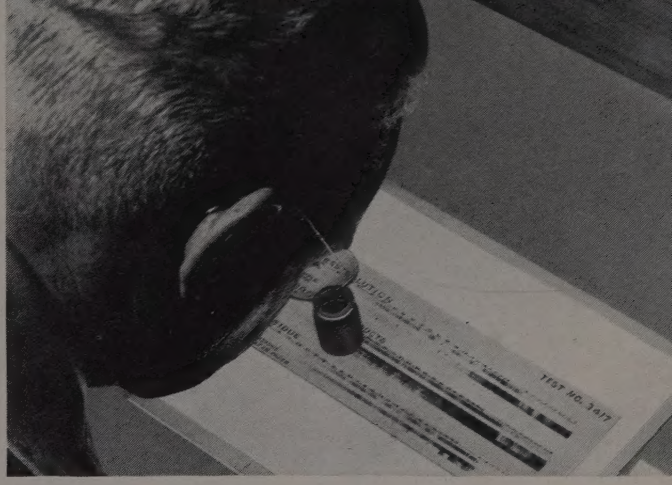
For information about opportunities in our engineering and research departments write us, stating your qualifications. Depending on the location you prefer, send your letter to Personnel Dept., Minneapolis-Honeywell, Minneapolis 8, Minnesota; Personnel Dept., Minneapolis-Honeywell, Brown Instruments Division, Philadelphia 44, Pennsylvania; or Personnel Dept., Micro Switch, Freeport, Illinois.

MINNEAPOLIS **Honeywell**

*First in Controls*

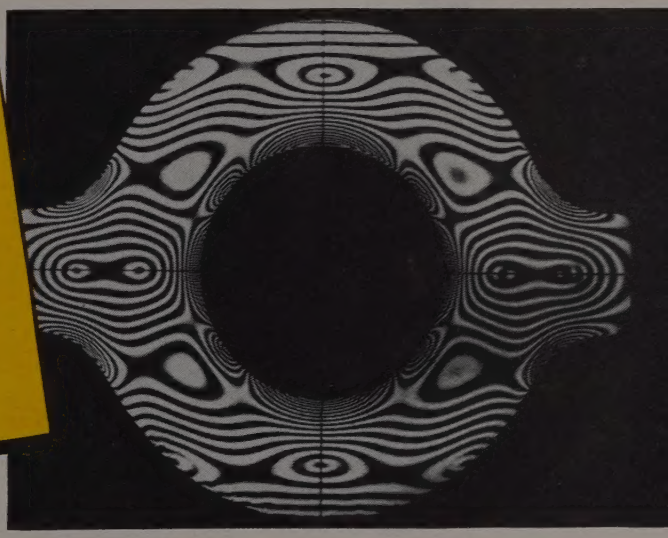


**REVEALS NEW FACTS ABOUT METAL STRUCTURE.** Electron micrography—up to X50,000 with the electron microscope—reveals new facts about metal structure, surface protection, and effect of processing procedures.



**DETERMINES COMPOSITION OF MATERIALS.** The composition of almost any material is shown in a flash through spectrography. It is a means of making frequent production line analyses that keep a check on specifications.

# Engineering has an ally in photographic analysis



**SHOWS STRESSES AND STRAINS VISUALLY.** By photographing the patterns developed by polarized light as it passes through a plastic model of a part, the engineer can have visible evidence of the points of stress within the part.

In the engineering laboratory—on the production line—photography is today an important tool. It searches metal structure through electron micrography, x-ray diffraction, and micro-radiography. It makes swift mechanical motions seeable by showing them at a snail's pace with high speed movies. Or it can halt an instant of an instrument's fleeting trace and record it for study.

**Eastman Kodak Company, Rochester 4, N. Y.**

**Send for this FREE Book**
*It tells how photography is used to:*
Speed production · Cut engineering time · Assure quality maintenance · Train more workers faster · Bring new horizons to research

**College graduates** in the physical sciences, engineering, and business administration regularly find employment with Kodak. Interested students should consult their placement office or write direct to Business and Technical Personnel Department, Eastman Kodak Company, 343 State Street, Rochester 4, N. Y.

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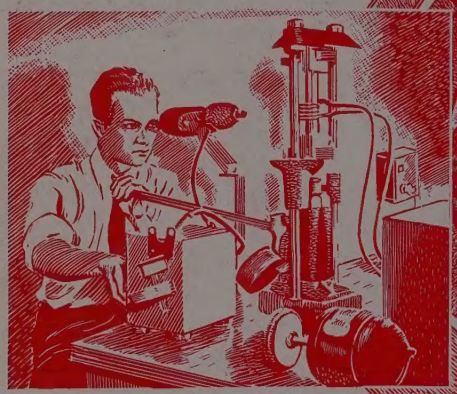
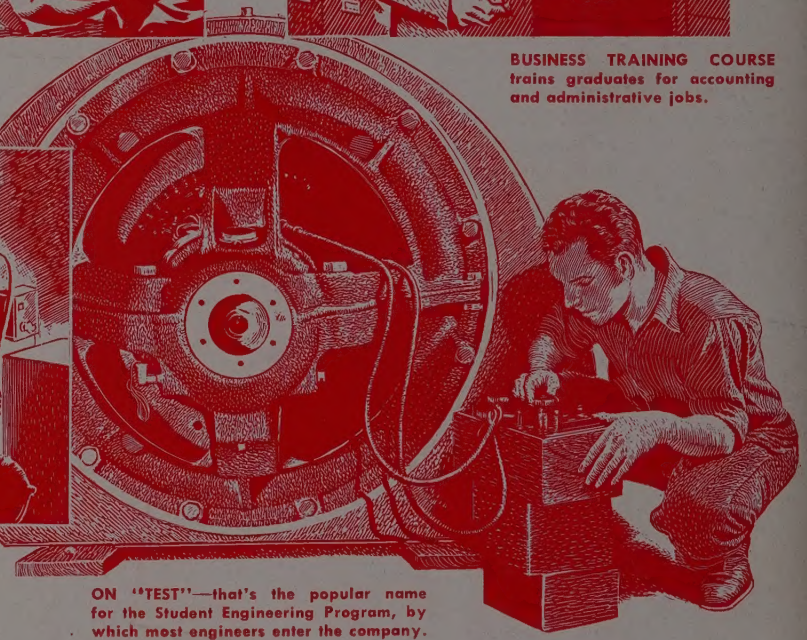
PHYSICS PROGRAM offers studies and rotating assignments for physics majors.

BUSINESS TRAINING COURSE trains graduates for accounting and administrative jobs.



CHEMICAL AND METALLURGICAL PROGRAM is for chemists, chemical and metallurgical engineers.



ON "TEST"—that's the popular name for the Student Engineering Program, by which most engineers enter the company.

# Four broad avenues by which college graduates begin careers with General Electric . . .

Both the individual and the company learn a lot when a college graduate enrolls in one of these four basic General Electric training programs.

The individual familiarizes himself with the company's products, organization, and problems. By rotating through a series of varied job assignments he determines the kind of work that most appeals to him and to which he feels he can make the greatest contribution. Many students go on from these courses to more specialized training in advanced engineering, sales, manufacturing, etc.

On its part the company learns about the individual's abilities and capacities. The training programs are a major means of recognizing young people of talent and creative ability, of making sure that they move ahead to new and constantly more challenging assignments.

A very large percentage of General Electric's top scientists, specialists and managers of today began their careers as student-workers in company-conducted training programs.

*You can put your confidence in—*

**GENERAL ELECTRIC**